NOVEMBER, 1944 VOL. 3 No. 9

Periodical

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

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Keep Wheels of Industry Rolling with KEMPSMITH *Standard* ATTACHMENTS

Heavy Duty Universal
Heavy duty angular milling in all planes. (Bulletin No. 104)

Circular Table
Milling circles or cams, gear cutting, high-speed continuous milling, etc. (Bulletin No. 108)

Hi-Speed Universal
High speed angular milling in all planes. (Bulletin No. 113)

Slotter
Keyseating, broaching, general slotting, tool and die making, etc. (Bulletin No. 107)

Vertical Head
Converts horizontal to vertical machine, retaining identical spindle characteristics. (Bulletin No. 105)

Dividing Head
Precision indexing. Spiral cutting mechanism and chuck also available. Bulletin 119.

Arbors and Accessories
A full range for standardized spindles carried in stock. (Bulletin No. 116)

Vises
Standard and Heavy-Duty, plain and swivel types. Adaptable to special jaws to save fixtures. (Bulletin 117)

Convert your general duty milling machine to a special purpose miller by utilizing Kempsmith Standard Attachments.

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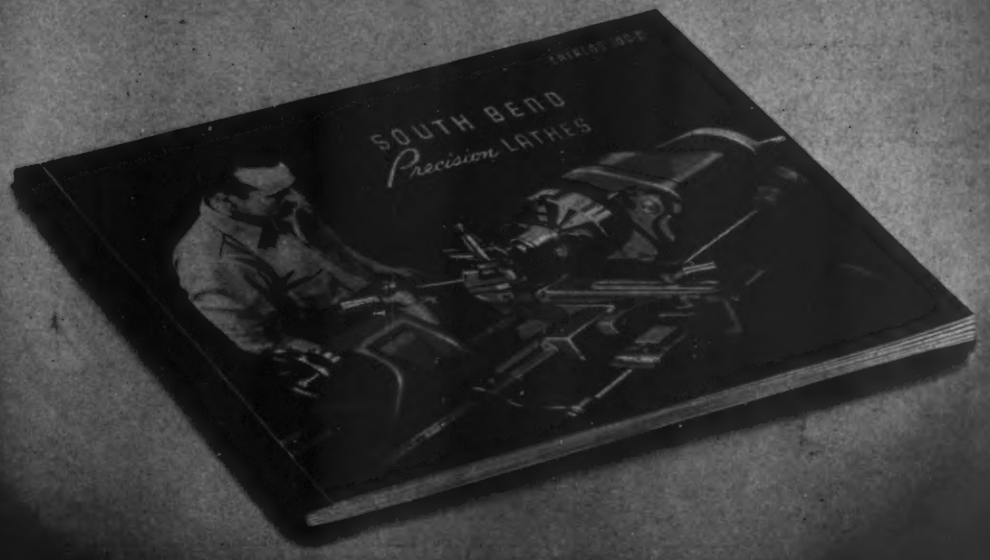

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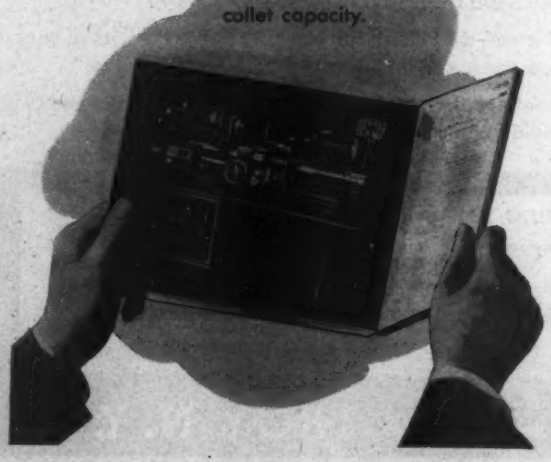

All sizes and types of South Bend Engine Lathes, Toolroom Lathes, and Precision Turret Lathes are clearly illustrated in color and described in this new catalog. Complete specifications including capacities, speeds, feeds, and weights are printed opposite the illustration of each lathe. All construction features, accessories, and attachments are also shown. Every user of machinery should have a copy of this catalog at hand for ready reference. Contains 64 pages, 11" x 8½" for standard file. Write today for your copy of Catalog 100-D.

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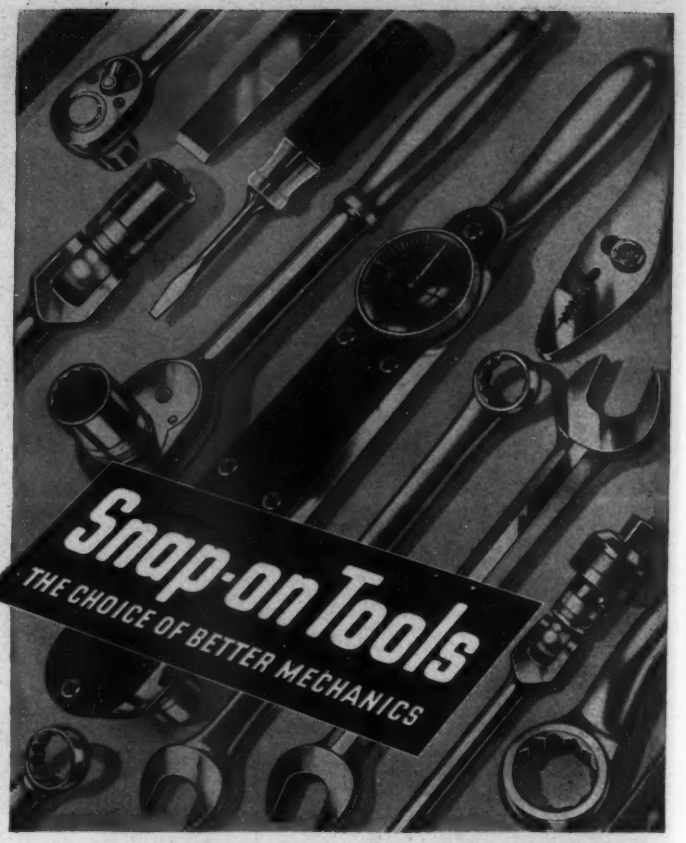

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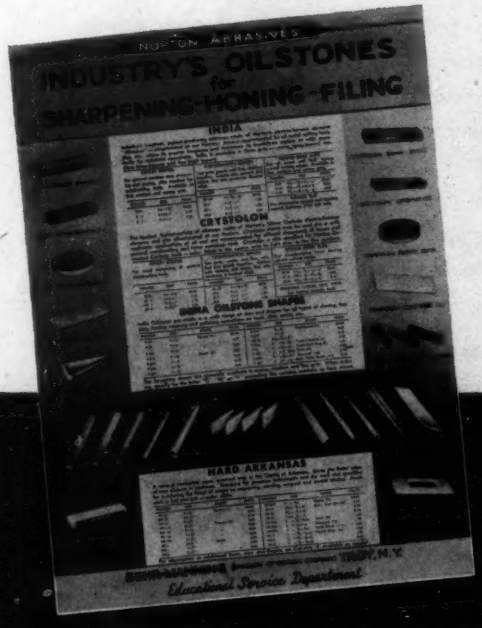

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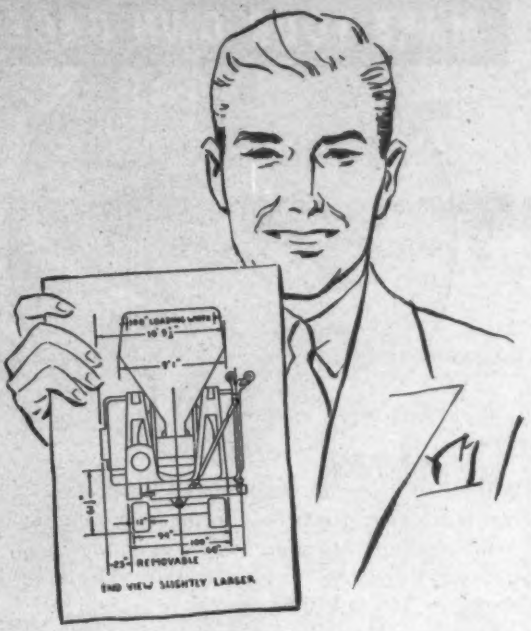

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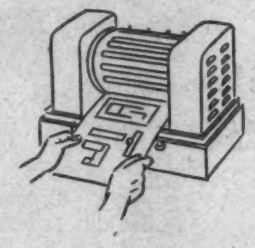

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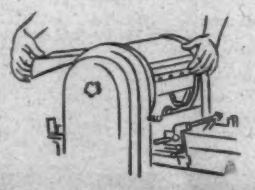

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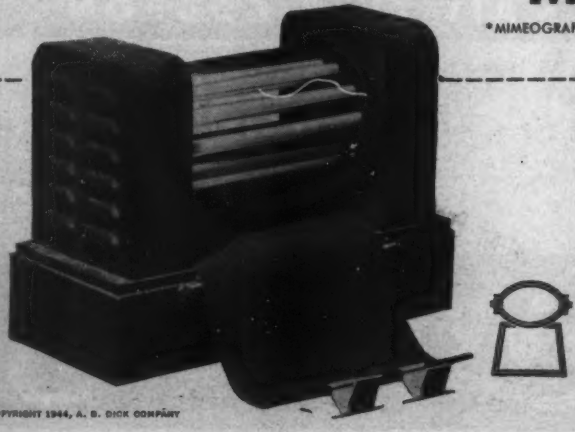

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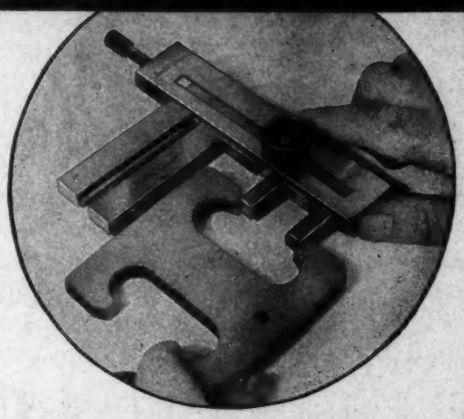

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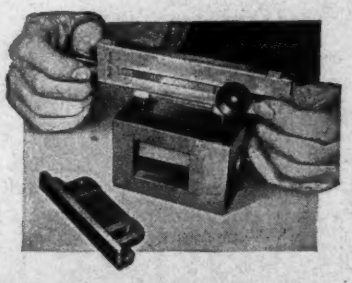

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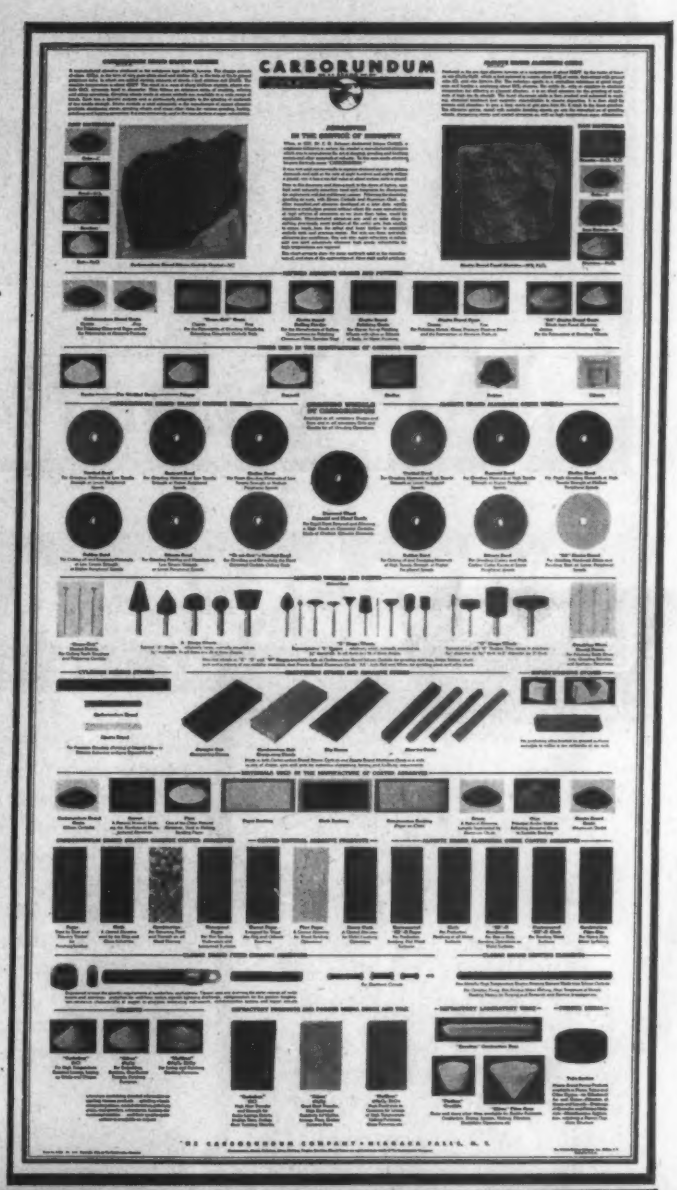

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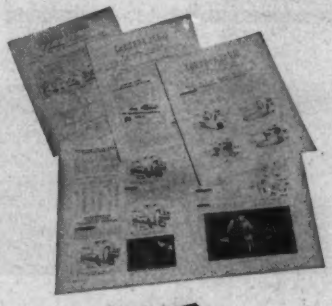

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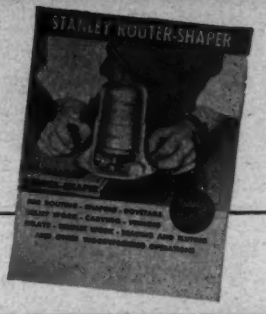

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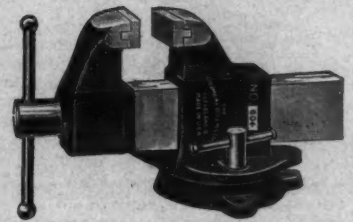

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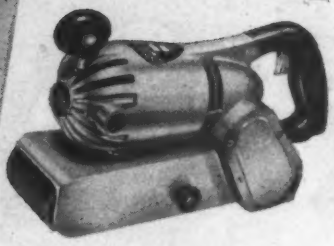

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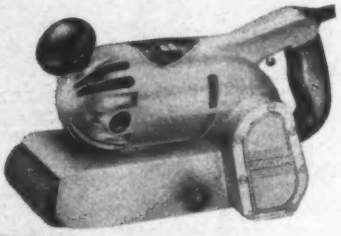

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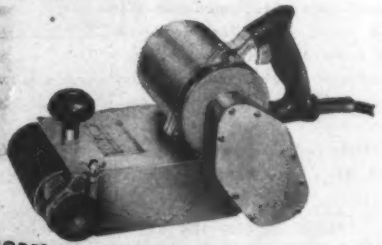

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You'll make better craftsmen out of students *quicker* if you teach them fine finishing work with SKILSAW BELT SANDERS . . . the sanders *preferred by industry* for power, speed and ease in handling.

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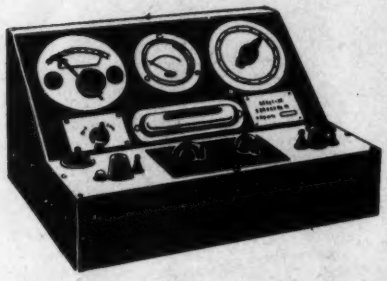

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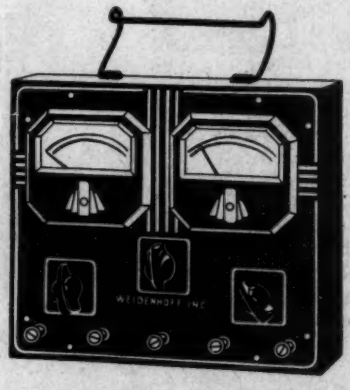

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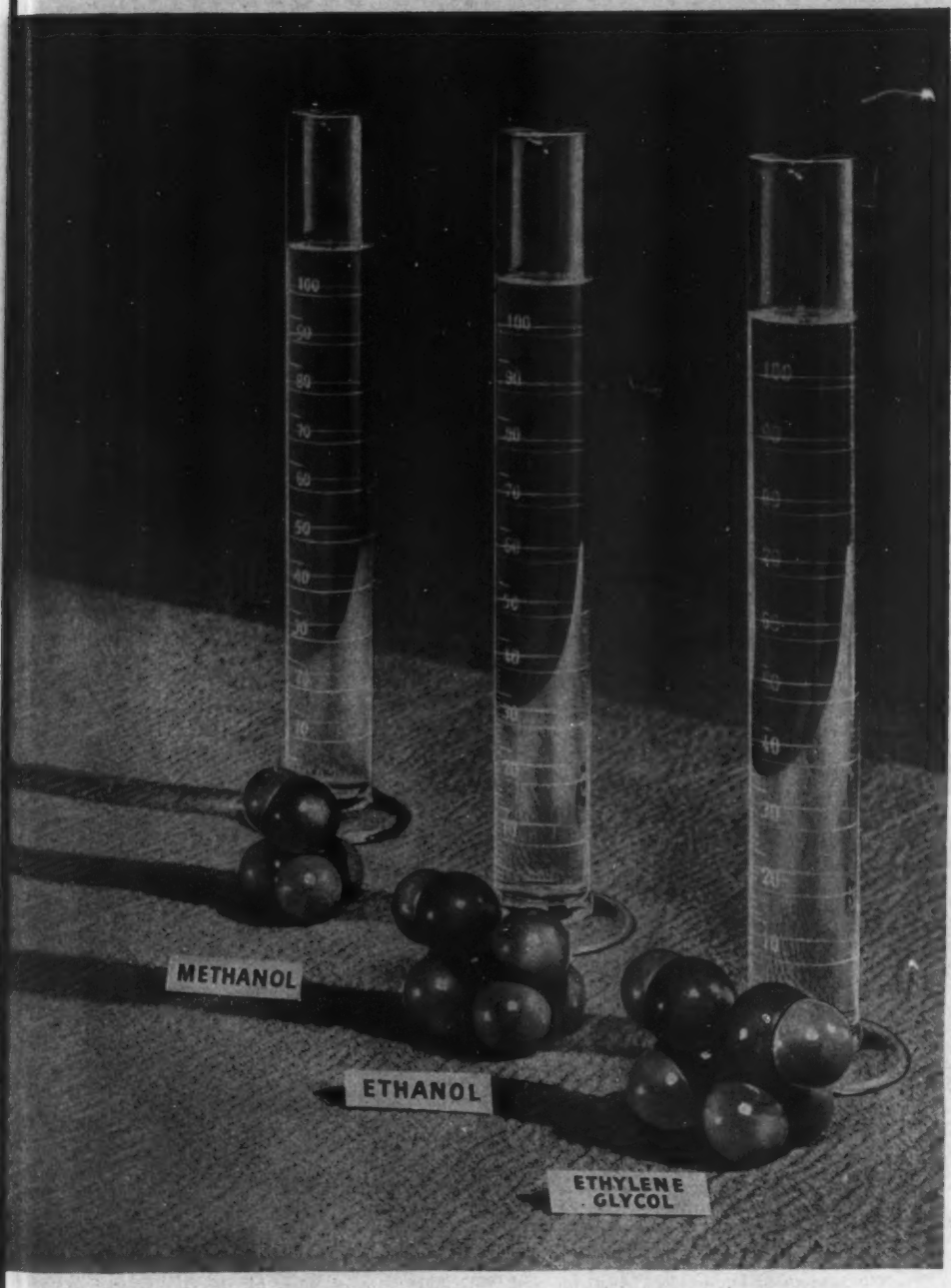

HERE ARE THREE CHEMICALS that you are probably better acquainted with from the way they *act* as anti-freeze in your car than from the way they *look* in print.

These chemicals are manufactured in large quantities by CARBIDE AND CARBON CHEMICALS CORPORATION. Uncolored, they are water-white. To the chemists, who must know what they will do in your car, they are compounds of carbon, hydrogen and oxygen, the atoms of which are shown here in the molecular models.

ETHYLENE GLYCOL, ETHANOL and METHANOL are the bases of anti-freezes—and they help to take one of the worries out of winter for millions of motorists.

TODAY AND TOMORROW

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"Prestone" ethylene glycol-base anti-freeze. One "shot" gives all-winter protection.

"Trek" methanol-base anti-freeze, which is again available to the extent that the production of methanol has caught up with its war-critical uses.

"Blue-Flo" ethanol-base anti-freeze. Not being manufactured this year because ethanol (ethyl alcohol) has a bigger war job to do.

Certain other anti-freezes formulated and manufactured by Units of UCC for large national distributors.

"Rustone" corrosion preventive which, when added to the water in a clean cooling system, inhibits the formation of rust.

▼

Car owners are invited to send for the booklet K-11 "Manual of Cooling System Service." It will be sent without cost or obligation.

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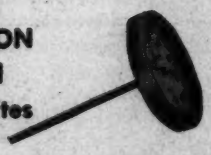

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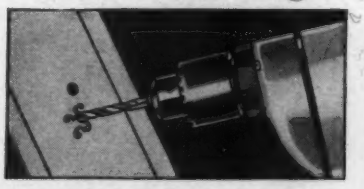
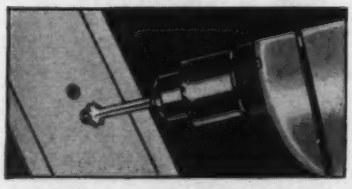


Countersinking



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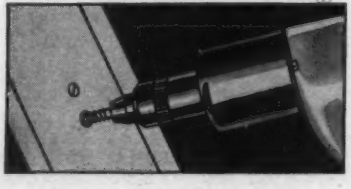

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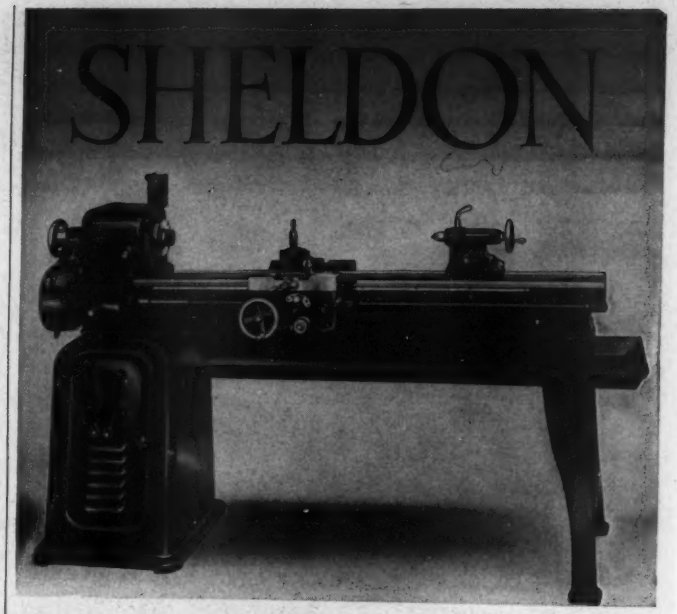

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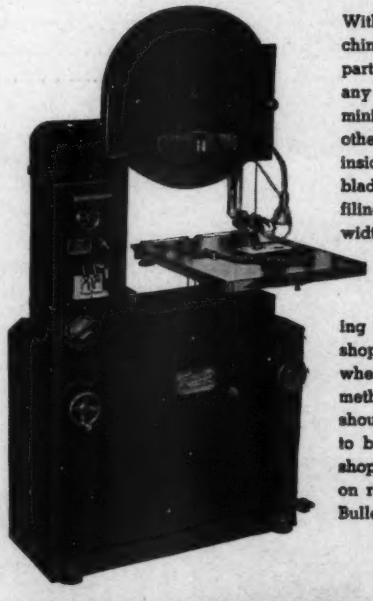

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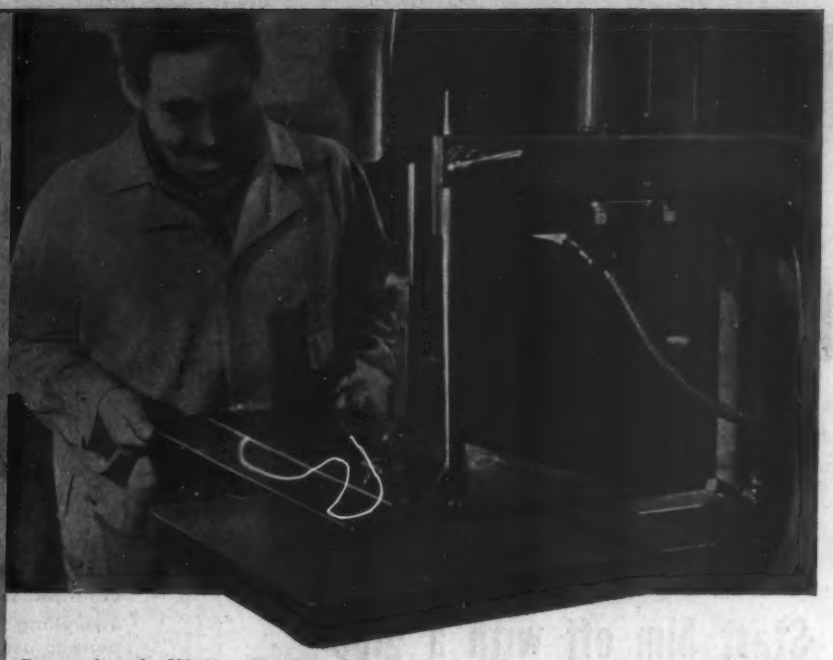

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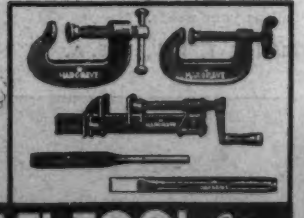

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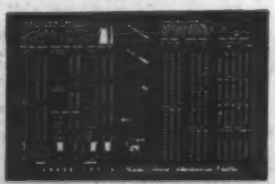

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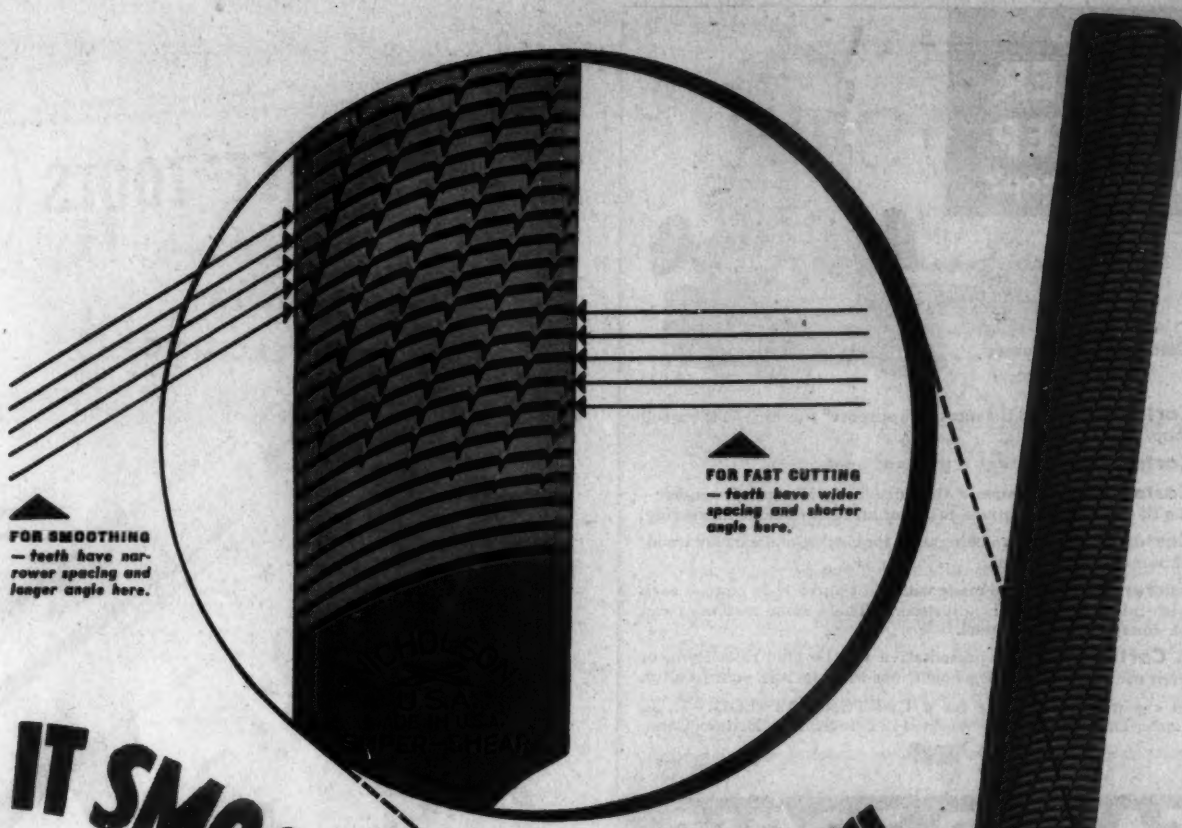
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— teeth have narrower spacing and longer angle here.
FOR FAST CUTTING
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IT SMOOTHS AS IT ROUGHS

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

VOL. 33 NOVEMBER, 1944 Number 9

Reconversion Tasks

The reconversion problems that deserve the attention of vocational educators right now are: training our returning veterans, training the disabled veterans and civilians, and training the war-production workers for peacetime jobs.

The text of Senate Bill S.1946 and House of Representatives Bill H.R.5079, which contain provisions for further extension to vocational education, and both of which have the full support of the American Vocational Association, deserve the earnest study of every one interested in vocational education.

Copies of these bills may be obtained from your senators or representatives.

Some Conventions to be Attended

• The Wisconsin Industrial Arts Association will meet at Milwaukee, Thursday and Friday, November 2 and 3, 1944.

This meeting will be held in conjunction with the convention of the Wisconsin Education Association. The headquarters will be at the Auditorium, Milwaukee, Wis.

• Central Association of Science and Mathematics Teachers will hold their annual convention at the Stevens Hotel, Chicago, Ill., on November 24 and 25.

• The National 4-H Club Congress will be held at the Stevens Hotel, Chicago, Ill., on December 3 to 5.

• The American Vocational Association convention will be held December 6 to 9 at the Benjamin Franklin Hotel, Philadelphia, Pa.

This Month's Cover

The picture chosen for this month's cover shows our marines coming out of the jaws of a U. S. Coast Guard manned LST at Cape Gloucester, New Britain. Official U. S. Coast Guard Photo.

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Editorial Contributions. — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

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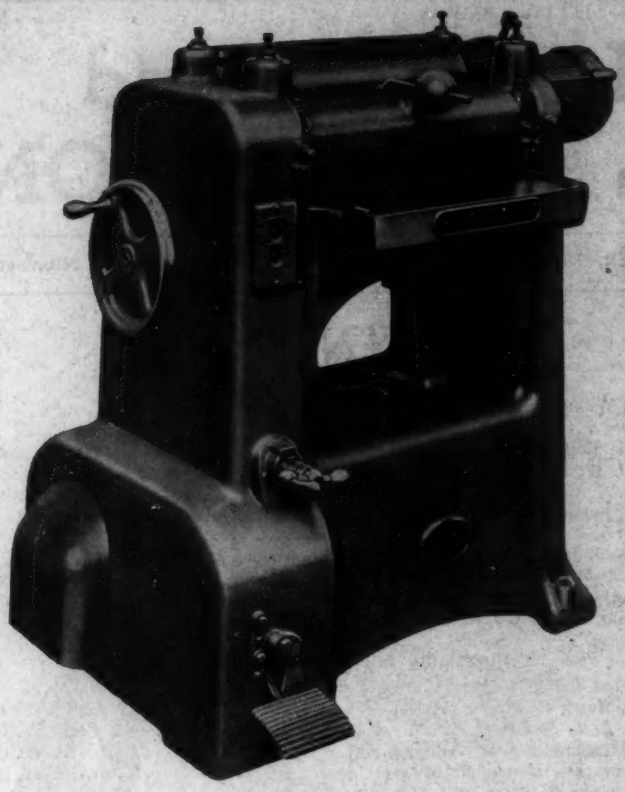
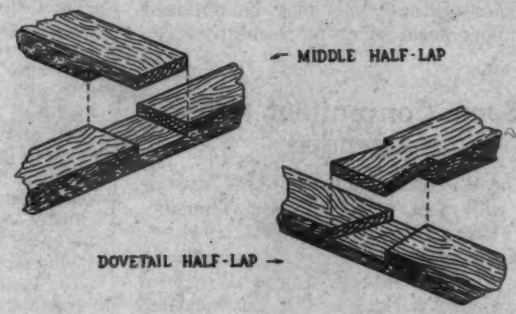


J-18

SURFACER

No. 3 of a Series

JOINTS AND THEIR USES



MIDDLE HALF-LAP JOINT
DOVETAIL HALF-LAP JOINT

These two modifications of the half-lap joint are used to a great extent to fasten two pieces of stock together in the form of a "T". The dovetail half-lap can also be made with a flare on one side only. Like the end half-lap, the middle half-lap is used considerably by the carpenter for the framing of sills. The dovetail half-lap is used more commonly in furniture construction. It is preferred where there is a pulling strain on the intersecting piece.

Machine design at Yates-American is guided by a number of "musts". Foremost of these is the rule that all machines must be simple in design and easy to operate. Things like involved construction and inconvenient controls are eliminated at the drawing board . . . before the machine goes into production. This is especially true if the equipment is intended for school shop use.

On the J-18 Surfacer, the base, two side frames and top girt are cast in one piece . . . simplified design which makes for greater strength. The bed is also a one-piece casting, easily raised and lowered by a hand wheel at the side of the machine.

However, the feature contributing most to the easy operation of this surfacer is its variable feed drive. This drive provides any speed from 15 to 45 feet per minute by simply turning a convenient hand crank . . . without stopping the machine. The operator can select the exact speed needed to produce the highest quality work regardless of whether hard or soft wood is used. All moving parts, of course, are fully enclosed.

YATES-AMERICAN MACHINE COMPANY • BELOIT, WISCONSIN

YATES-AMERICAN

Employee Training at Willow Run

ALAN R. PAWELEK*

Because of the heterogeneous groups received at the employment office of the Willow Run Bomber Plant, a testing procedure has been devised by which a segregation is attained according to levels of educational achievement and capacity. The results of the tests along with the past experiences of the individual determine in part the role he will play in the national war effort. Since the testing program has gone into effect, the *trainees* received in the electrical department of the airplane school for preparatory training in the electrical system of the B-24E Bomber, have a higher level of intelligence, more formal education, and an indicated aptitude for this type of work.

*Embry Riddle Co., School of Aviation, Miami, Fla.

At the time of completing the procedure of becoming a worker in the Ford Motor Company, the prospective electrical employee is taken through the entire plant to get an overall view of the organization of which he will become a member. Movies of the airplane are shown, short talks by instructors are given, in fact, practically a whole day is spent in the orientation period. After the trainee has been prepared in this manner for things that lay ahead, he is sent home and told to come back at a set time the following day.

The training course now begins in earnest. Group instruction and demonstrations in electrical theory are given two hours a day for 15 days. The other seven hours of the day (the plant is on nine-hour shifts) are devoted to practice in soldering, drilling corprene wrapping and tying, attaching of stakon lugs, and working on small assemblies. Upon learning this type of work the student is shifted to each department of the plant dealing with electrical wiring and installations for a period of three to eight days. This latter procedure takes place during and after the theory training in the school. Thus the employee is exposed to every phase of the electrical system of the B-24E Bomber, along with theory and blueprint reading, which he receives during the time spent in the classroom. When this training is terminated after a period of six to eight weeks, the trainee is potentially qualified to become a circuit checker, trouble shooter, or inspector. Naturally only the best students are taken for these jobs, while the average or lower groups are used for assembly, production, or installation work. Figure 1 is the individual rating which shows how the records on each individual are kept by the electrical training department.

Before perusal of the following course outline it may be well to remember that work sheets, diagrams, and explanations have been compiled into booklet form to be used by the trainee for homework and reference study. The school has two fully completed planes so that the student may learn by observation the functioning of devices included in the B-24E. The classrooms also are equipped with a transparent model of the B-24E showing the structure of the airplane, and its component parts,

INDIVIDUAL RATING SHEET

NAME_____ BADGE NO._____ DATE STARTED_____

Use letter grades indicating the following items concerning the above student in the space given for your department.

LEGEND

A-Superior B-Very Good C-Average D-Below Average E-Very Poor

DEPARTMENTS

	920	916	985	914	937	938	939	940	947	Army Ship
THEORY GRADE										
QUALITY OF WORK										
INTEREST IN WORK										
ATTITUDE TOWARD SUPERIORS AND FELLOW WORKERS										
INITIATIVE - ABILITY TO WORK WITHOUT HELP										
ADAPTABILITY- ABILITY TO GET ALONG AND DO THE WORK										
COOPERATIVENESS - WILLING TO HELP SUPERIOR OR OTHER WORKER										
FINAL GRADE - OPINION OF TRAINEE IN GENERAL										

Additional Comments:

Rating given by:

Name	Dept.	Name	Dept.
1.		5.	
2.		6.	
3.		7.	
4.		8.	

Fig. 1. Individual rating sheet

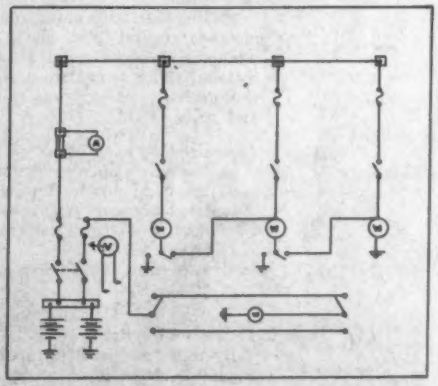


Fig. 2. A 36 by 40-in. panel, useful in teaching series and parallel circuits

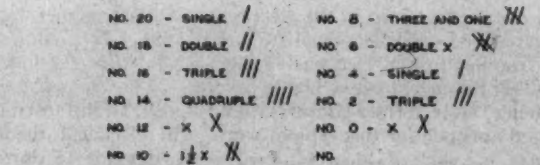
such as batteries, coils, lights, starters. The smaller parts also are furnished for disassembly and demonstration. The panel shown in Figure 2 was made by the instructors for the purpose of demonstrating current flow, series circuits, parallel circuits, three-way switches, and the like.

This classroom training of the electrical employees was conceived for a time limit of thirty hours, but with more extensive study it could easily become a part of a full term's work in a preflight course, for a high school or college curriculum.

The course outline, as prepared, is designed to be suggestive only. The time, arrangements, assignments, and course material, will vary with individual needs and the instruction staff. Most of the work outlined here is readily adaptable to all types of planes with the exception of the codes which obviously would not be the same.

Outline of Instruction

Unit	Day	Time	Lectures, Discussions and Demonstrations	Homework
A. The Airplane	(1)	2 hours	*Parts of the Plane* Lecture and demonstrate with the model and drawings the various parts of the ship as to name, location, and function. See study sheet on definitions, and Figure 3 showing parts of the plane. Both of these may be found at end of this outline.	Learn parts of the plane as to name, location, and function.
	(2)	30 min.	1. *Safety Rules* Read with the class and explain. See lesson on safety at end of this outline.	Study the rules thoroughly. Learn the stations and compartments as to location and function.
		60 min.	2. *Compartments and Stations* Using the study sheet on compartments and stations. Figure 4, locate the crew as to place of operation and duties.	
		30 min.	3. Visit the airplane or use a model, reviewing items to be learned in the two previous lessons.	
	(3)	2 hours	*Tool and Material Procedures* *a*) Demonstration of the procedure to be used in handling the following tools: Screw driver, stakon pliers, diagonal wire cutters, wire strippers, long nose pliers, and the soldering iron. *b*) Discussion of the methods of identifying steel, brass, and aluminum, nuts, bolts, and washers. (Weight, color, magnetism, and markings.) *c*) *Aluminum Handling* A lecture is given on the B-24E as a "Skin Stress Job" and the resultant need of proper aluminum handling. By drawing an enlarged cross section of a piece of alclad (aluminum alloy covered with a coating of the metal in a pure state on the board) show the reason for the words "Scratched alclad is scrapped alclad." See the lesson on Aluminum Handling at the end of this outline. *d*) Demonstration of the proper methods (spiral and flat) of wrapping the tying corprene, the material which is used to protect the insulation of electrical cables and wires.	Learn, practice, and be able to demonstrate correct manipulative procedures.
B. Electricity	(4)	2 hours	*Fundamentals of Electricity* *a*) Voltage, amperes, resistance *b*) Electrical current flow, electrical pressure, resistance to flow of electrical current *c*) Ohm's law 1. $E = IR$ 2. $I = E/R$ 3. $R = E/I$	Do problems under "Homework." (See page 354)
	(5)	2 hours	1. *Series Circuits* By using the panel pictured in Figure 2 show that: *a*) Voltage is divided between resistors *b*) Line current is decreased *c*) Line resistance becomes greater.	Give at least five mathematical problems to solve concerning series circuits.
			2. *Practical Applications* *a*) Circuits in the airplane *b*) Circuits in the factory *c*) Circuits in the home	
	(6)	90 min.	1. *Parallel Circuits* By using the panel in Figure 2 show that: *a*) Voltage remains the same to all resistors. *b*) Line current is increased. *c*) Line resistance becomes smaller than the smallest resistor in the circuit.	Give at least five mathematical problems to solve concerning parallel circuits.
			2. *Practical Applications* *a*) Circuits in the airplane *b*) Circuits in the factory *c*) Circuits in the home	
		30 min.	3. *Explain the mechanics of:* *a*) 3-way switches *b*) Alternating and direct currents *c*) Inverters — converters	
C.	(7)	2 hours	*Presentation of:* 1. The wiring code All wires may be identified as to devices served by a letter code which all trainees are asked to memorize, e.g. A — Heaters B — Bombs and bomb controls C — Prop. controls D — De-icer-pitot heater (anti-icer motors, hyd. booster) M — Landing gear and flaps P — Power R — Radio S — Starter E — External lights G — Instruments K — Automatic pilot L — Light — internal T — Engine controls H — Magneto ground HT — High tension V — Instrument lights and miscellaneous 2. *Wire Sizes* In the event a wire is not labeled as to size or if a check is to be made, the student is expected to know the size of a given wire merely by visual inspection. This is accomplished by memorizing the number or pattern of the tracers included in the insulation of the current conductors: 3. *Code of Individual Wires* Individual wires are identified by a code number attached with	Memorize the wiring code, wire sizes, and harness identification numbers.


NO. 20 - SINGLE /
NO. 18 - DOUBLE //
NO. 16 - TRIPLE ///
NO. 14 - QUADRUPLE ////
NO. 12 - X X
NO. 10 - 1½ X
NO. 8 - THREE AND ONE
NO. 6 - DOUBLE X
NO. 4 - SINGLE /
NO. 2 - TRIPLE ///
NO. 0 - X X
NO.

Unit	Day	Time	Lectures, Discussions and Demonstrations	Homework
			scotch tape at each end. For example, the number 16P256 would indicate a No. 16 size of wire in the *power circuit*, the 256 would indicate the number of the wire in the circuit. *4. Harness Numbers* Each harness of electrical conductors may be identified as to its origin and termination by the number attached to it. The following is the code used as to location, since an attempt to name and identify all harnesses here would be superfluous: 2600 — Engine — (in the nacelle) 2500 — Wing location 2000 — Fuselage location 8200 — Engine controls (Fore of the instrument panel) *5. Cannon Plugs and Q Strips* These are demonstrated as to function, installation, location, and repair.	
(8)	2 hours		1. *Single Wire Ground Return System* Demonstration of the ground system on the panel showing how it functions and giving the reasons why it is used: *a*) Saves weight *b*) Saves wire *c*) Simplicity 2. *Circuits Not Grounded* *a*) Bombardier's forward heater *b*) Pitot heater Lecture on why these are not grounded by showing their location near the compass, and the effect a single wire carrying current would have on a magnetic needle. 3. *Magnetism* *a*) Molecular theory *b*) Magnetic lines of force *c*) Applications: Motors, generators, solenoid relays, etc. 4. *Solenoid Switches* *a*) Principle of operation *b*) Application *c*) Location	Study lesson sheets on magnetism and do written work.
(9)	2 hours		1. *Fuses* *a*) Function *b*) Location *c*) Code: 2 — 50 — 2 ampere 3 — 50 — 5 ampere 4 — 50 — 10 ampere 5 — 50 — 15 ampere 6 — 50 — 20 ampere 2. *Electrical Symbols* *a*) Hand out study sheet of symbols to each student. See Figure 5. *b*) Lecture on each individual item, drawing the symbol on the blackboard and explaining its function in an electrical circuit.	1. Learn fuse code. 2. Learn what each symbol represents and its application in electrical wiring.
D. (10) Circuit Checking and Inspection	1 hour		1. *Ringout of Circuits* By use of an ohmmeter, light, and buzzer, demonstrate how circuits are checked for: 1. Recognition of wires 2. Continuity of circuits 3. Improper grounding 4. Malfunction of electrical appliances. Study lesson on "Checking and Testing Circuits." 2. *Fuses* Explanation of how to check a fuse for continuity: 1. Visual inspection 2. Use of test light 3. *Bonding* 1. Explanation of the use of and limits in the resistance of bonds, e.g., .004 of an ohm for structural bonds and .001 of an ohm for bonds within the nacelle.	Hand out lesson on "Checking and Testing Circuits" to study and learn. (See this lesson at end of article.) Draw out one parallel circuit and one series circuit using at least five different symbols.
	1 hour		4. Practice in circuit checking in the school mock-ups and plane.	
(11)			1. *Location of Devices on the Ship* Location and explanation of some of the more common equipment, paying especial attention to: *a*) Fuse boxes *b*) External lights (navigation, landing, recognition, bomb release, formation, and passing) 2. Explain the diagrammatic layout of the power circuit of the B-24E. *Note:* Since the above is restricted material it cannot be given here, but it can be said that power is furnished by four 200 ampere 28 volt generators, two 35 ampere hour 24 volt batteries, and a 70 ampere auxiliary power unit.	1. Learn location and contents of the fuse boxes. 2. Be able to identify the various kinds of lights. 3. Study power outline.
D. (12)	2 hours		1. Explanation of (See lesson on Electrical Blueprint Reading at end of this article): *a*) Blueprints *b*) Ozalids *c*) Schematics *d*) Bus bars *e*) Outside power circuit *f*) Heater solenoids *g*) Autosyn and Selsyn instruments	Draw a schematic diagram of one circuit on the plane, making sure that all details are given.
E. (13) Examination	2 hours		1. Review of all materials and assignments 2. Discussion of student's questions 3. Summary and applications of principles	Review
(14)			*Test* — See test and key at end of this article.	
(15)			*Review of Test* 1. Discussion of questions most frequently missed by the group 2. Summary of grades 3. Final review of course	

As was explained previously the student's training is completed by his doing practical work in the various electrical departments. Upon completion of the program, an over-all view of the individual's grades, workmanship, interest, etc., is carefully taken into account, so as to place the employee into the unit of work for which he is best qualified. The trainee then becomes a full-fledged Ford employee, working as one small but integral part of the vast Willow Run Bomber Plant which is dedicated to the cause of an "Ultimate and Final Victory."

B-24E Electricity Trainee Examination

Name.....Badge No.....Grade....

1. A lamp connected to a 24-volt battery draws 3 amperes. What is the resistance of the lamp? .....

2. A resistance draws 60 amperes and has a value of 4 ohms. To what electrical pressure is it connected? .....

3. If a resistance of 10 ohms is connected to an electrical pressure of 28 volts how much current will flow? .....

4. Electrical pressure is measured in what units? .....

5. Electrical current is measured in what units? .....

6. Electrical resistance is measured in what units? .....

7. Does a lamp take more or less current after the current has flowed for a short length of time? .....

8-9-10. Write ohm's law in three different ways. ....., ..., ...

Fill in the following spaces with the compartment name corresponding to the station number. See Figure 4.

0.....1.0.....2 & 3.....4.....6.
11 12 13 14
6.....92.....10.
15 16

Draw the code markings of each of the following wires:

17. No. 20.....	22. No. 2.....
18. No. 12.....	23. No. 0.....
19. No. 6.....	24. No. 8.....
20. No. 18.....	25. No. 4.....
21. No. 14.....	26. No. 10.....

27. Why are heavy wires used in some places while lighter wires are used in others? .....

Match the following by placing letter of proper item corresponding to part, on blank line to the right of the item number.

28..... Spar	*a*) tail assembly
29..... Bulkheads	*b*) keeps plane from turning right or left
30..... Empennage	*c*) used for climbing or diving the ship
31..... Inboard	*d*) used to hold harness
32..... Nacelle	*e*) main support of the plane upon which is hung the landing gear, engines, etc.
33..... Skin	*f*) main diving stations and supports of the fuselage
34..... Stringers	*g*) fixed surface between fin and tail
35..... Frame	*h*) used to bank the ship
36..... Clips	*i*) toward the fuselage
37..... Elevator	*j*) vertical supporting members of the fuselage
38..... Aileron	*k*) used as a brake to reduce landing speed
39..... Center wing	*l*) engines and engine accessory covering
40..... Vertical stabilizer	*m*) main supporting strut on landing gear
41..... Tab	*n*) covering of the plane
42..... Rudder	*o*) reinforcing member to give added strength
43..... Horizontal stabilizer	*p*) used in case the plane is in an unbalanced condition
	q) used to hold bulkheads and skin in position. They run lengthwise of the plane.
	r) used to turn the ship from left to right or right to left
	s) main support for the wing

44. Why is it necessary to keep a soldering iron tinned? .....

45. What is the only kind of flux used in airplane soldering? .....

46. What tool is used to take the insulation off of the end of a wire? .....

47-48. Name two reasons why a soldered wired joint should not be heated too much. 47..... ..... 48.....

Place proper number of circuit corresponding to code letter in space to left of that letter.

49. A	(1) Pitot tubes
50. V	(2) instrument lights and miscellaneous
51. E	(3) magneto grounds
52. K	(4) high tension
53. L	(5) engine controls
54. T	(6) radio
55. R	(7) starter
56. M	(8) power
57. G	(9) center wing
58. B	(10) landing gear and flaps
59. D	(11) internal light
60. H	(12) instruments
61. P	(13) automatic pilot
62. H.T.....	(14) external lights
63. S.	(15) de-icer-pitot heater, etc.
64. C	(16) prop controls
	(17) bombs and bomb controls
	(18) heaters

65. What type of wiring is used on the B-24?

66-67. Name two advantages of a solenoid switch. 66..... 67.....

68. Give the reason why two wires are connected to the bomber's forward heater and the Pitot tubes? .....

69. How tight should cannon plugs which are available to the crew be? .....

70. What is used on terminals to be sure that the lugs do not come loose? .....

71. A nut of what material should be used on ground terminals? .....

72. What voltage is used on the electrical system of the B-24? .....

73. In what type of circuit is the combined resistance less than the smallest resistor in the circuit? .....

74. In what type of circuit are the voltages added? .....

75. What is used to lubricate the threads of a cannon plug? .....

76. What is the effect of loose electrical connections? .....

77. Why is spaghetti used on lugs? .....

78. Why is corprene used to cover wires or harnesses? .....

79-80-81. What three devices are used to check circuits? 79..... 80..... 81.....

82. Why should wires never be left near the frame of the ship or any piece of metal when the job is left for a while? .....

83-88. Draw a parallel circuit using two lamps, one resistor, a switch, a fuse, and a battery.

89-94. Draw a series circuit using the same items listed in items 83-88.

95. If a wire that is too small is used to operate a certain device what will happen to the operation of the circuit? .....

96. Why is a No. 4 wire used to operate the starter motor while a No. 16 is used to operate the solenoid for the starter? .....

Draw the symbols for the following:

97. Wires crossing but not connected.
98. Wires connected together.
99. A solenoid switch.
100. A single pole, single throw switch.
101. A single pole, double throw switch.
102. A rheostat.
103. A resistance.
104. A *Q* strip with four terminals.
105. A cannon plug.

106. Give a good reason why alclad should not be scratched. .....

107. Why should the plastic covering on wires never be scraped? .....

108-109. Name two items on the plane that use alternating current. 108..... 109.....

110. What kind of nuts are used on "Q" strips? .....

111. How many digits does a steel nut have? .....

112. How many digits does a brass nut have? .....

113-116. Name four effects of electricity.
113..... 114.....
115..... 116.....

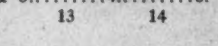
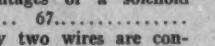
117-123. Name seven fuse boxes on the B-24E.
117..... 118.....
119..... 120.....
121..... 122.....
123.....

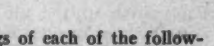
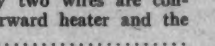
124. How do like magnetic poles react on each other? .....

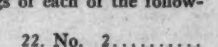
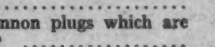
125. How do unlike magnetic poles react on each other? .....

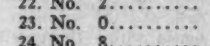
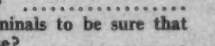
KEY TO B-24E ELECTRICITY TRAINEE EXAMINATION

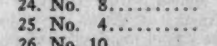
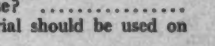
1. 8 ohms	9. I = E/R
2. 240 volts	10. R = E/I
3. 2.8 amps	11. Nose
4. Volts	12. Pilot's floor
5. Amperes	13. Radio
6. Ohms	14. Bomb bays
7. Less	15. Tunnel or shaft
8. E = IR	16. Tail turret

17.  18. 

19.  20. 

21.  22. 

23.  24. 

25.  26. 

27. Heavy wires can supply more current

28. S	31. I	35. J	38. H	41. P
29. F	32. L	36. D	39. E	42. R
30. A	33. N	37. C	40. B	43. G
	34. Q			

44. To hold the solder. The tinning also helps to distribute the heat.

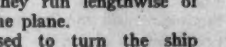
45. Rosin 46. Wire strippers

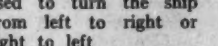
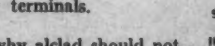
47. May burn insulation

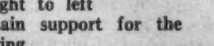
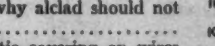
48. May stiffen wire through capillary action of solder

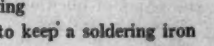
49. 18	53. 11	57. 12	61. 8
50. 2	54. 5	58. 17	62. 4
51. 14	55. 6	59. 15	63. 7
52. 13	56. 10	60. 3	64. 16

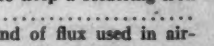
65. Single wire ground return
66. Saves weight 67. Remove control
68. Deflection of compass needle
69. Finger tight 73. Parallel
70. Self-locking nuts 74. Series
71. Steel 75. Antiseize
72. 28.5
76. Heat or high resistance
77. Insulation of lugs 80. Light
78. Protect insulation 81. Ohmmeter
79. Buzzer
82. Short circuit may occur
83-88. Check on parallel circuit. Give one point for each device correct in the circuit.
89-94. Check on series circuit. Give one point for each device correct in the circuit.
95. The wire will burn and the system will not operate.
96. Motor takes more amperage.

97.  98.

99.  100. 

101.  102. 

103.  104. 2-4 _____

105. 

106. Alloy inside may corrode and break.
107. It will ruin the insulation.
108. Autosyn instruments
109. Automatic pilot 113. Heat
110. Brass 114. Light
111. Four 115. Magnetism
112. Two
116. Electrolysis — (Chemical change)
117. Heater 120. Liaison
118. Pilot 121. Bomb bay
119. Copilot 122. Station 6.1
123. Inverter relay junction box
124. Repel 125. Attract

Definitions

The electrician must become familiar with all the parts on the plane and their function, in order to thoroughly understand his work. The most common terms are listed below and are to be *memorised*.

aileron. The movable portions of the outer-wings attached to the trailing edge. They are used to bank the plane.

aft. To the rear or behind. Toward the tail of the plane.

aft compartment. The section of the plane aft of the bomb bay from station 6.0 to 10. occupied by the waist gunners and tail gunner. The tunnel section is part of the aft compartment extending from station 8.0 to 9.2.

automatic pilot. A mechanism used to control level flight or on a set course as determined by the ship's pilot.

belt frames. The belt frames are the smaller vertical supports of the fuselage.

bomb bay. The section of the plane from station 4 to station 6 in which are located the bomb racks. The bomb doors extend from the bottom sides of the fuselage and curve to the catwalk running through the center of the bomb bay.

bombers compartment. Also called the nose compartment. The compartment in the nose from station 0 to 1.0 and is occupied by the bombardier and navigator.

bulkheads. The bulkheads are large vertical supports of the fuselage. They also serve as the main divisions between the compartments of the ship.

center wing. The main part and support of the plane. Upon it are hung the fuselage, landing gear, engines, etc.

clips. Small metal strips which are used to hold electrical harnesses after placement in the plane.

de-icers. The de-icers are rubber coverings over the leading edges of the wing, horizontal stabilizer, and vertical stabilizers. Under icing conditions these are blown up through pressure tubes, thus causing a cracking of the ice. As they deflate, the ice is blown off by the air stream going past the plane.

elevators. The elevators are attached to the trailing edge of the horizontal stabilizer. They are used for diving or climbing the plane.

empennage. The entire tail assembly which consists of the vertical stabilizer (fins), horizontal stabilizer, rudders, elevators, and tabs.

fairing. A fairing is an auxiliary panel of sheet metal used to decrease the wind resistance of any part to which it may be attached.

fire wall. The steel plate which protects the wing against fire. It covers all the wing area inside the nacelle.

flap. The movable portion of the center wing attached to the trailing edge. It is used to help gain altitude on the take-off or as an air brake prior to landing.

flight deck. Also called the pilot's floor. The compartment from station 1.0 to 3.0 occupied by the pilot, copilot, and radioman above the nose wheel compartment.

fore. To the front or ahead. Toward the nose of the plane.

fuselage. The fuselage is that part of the ship that carries the crew and cargo or passengers.

horizontal stabilizer. The fixed surface between the two fins. It assists in keeping the plane in level flight.

inboard. Toward the center of the fuselage.

landing gear. The understructure which supports the plane when on the ground and absorbs the shock of landing through a system of struts and pneumatic tires.

leading edge. That edge of the wing, horizontal stabilizer, and vertical stabilizers, which faces into the direction of flight.

nacelle. The housings fastened to the center wing in which are mounted the engine and engine accessories.

oleo. The main strut of the landing gear.

outboard. Toward the outside from the center of the fuselage.

radio floor. The floor directly aft of the flight deck on which most of the radio apparatus is installed. It extends from station 3.0 to 4.0.

ribs. The ribs are located between the spars and form the main transverse supports of the wing.

rudders. The two rudders are hinged to the fin's trailing edges. They are used to turn the plane in any direction.

skin. The term used to designate the sheet-metal covering of the airplane structure.

spar. There are two spars, one on the leading edge and one on the trailing edge of the wing. They are vertical members which form its main horizontal supports.

stringers. The stringers run lengthwise of the wing and fuselage. They are used to hold the bulkheads and belt frames in position.

tabs. A small auxiliary portion of the right wing, rudders, and elevators, which is attached to their trailing edges. The tabs are used in case the plane is in an unbalanced condition to make handling easier.

trailing edge. That edge of the wing, horizontal stabilizer, and vertical stabilizers which is aft of, or behind the leading edge.

vertical stabilizer (fin). That part of the empennage that affords directional stability, that is, assists in keeping the ship in a straight line flight. They are the fixed vertical surfaces forward of the rudders.

Water line. An imaginary horizontal line around the fuselage which is level when the plane is in flight. It is designated inside the ship by small punch marks on the bulkhead flanges.

wheelwell. Two recesses in the center wing, between the inboard and outboard engines which house the landing gear while plane is in flight.

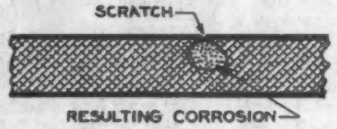
Aluminum Handling

Since many types of planes are made of aluminum, it is necessary to know how to handle aluminum parts and also what precautions to take when installing equipment on aluminum planes.

Pure aluminum is an excellent corrosion or oxidation resisting metal, and will not corrode in sea water, or harmful vapors. In order to give it greater strength, however, copper, manganese, and magnesium are added in small fixed quantities. The resulting alloy is then called duralumin, or dural for short. This alloy does not have the corrosion resisting properties that pure aluminum has and must, therefore, be protected against corrosion. This is accomplished by putting a layer of pure aluminum on each side of the alloy, the thickness of each layer being about 5 per cent of the total thickness of the sheet. See figure below. Aluminum alloys protected in this manner are called "Alclad" or "Pureclad."

Another method of protecting alloys is to oxidize the surface of the alloy since the oxidation is self-limiting; that is, once the oxide layer is formed, it seals the surface and no more oxide can form. This is a chemical dip process and is called "Alrok."

Since the outside surface of the plane consists of thin aluminum alloy sheet, it is imperative that every precaution be taken to prevent scratching or nicking the skin, either outside or inside. A scratch or nick removes the protecting aluminum coating and paves the way for rapid corrosion of the alloy underneath, just as a tooth decays when the enamel covering is broken. This corrosion weakens that particular section of the skin and will result in failure of that particular section when put under strain and vibration. See figure below.



A scratch or nick also decreases the thickness of the alloy, thus forming a weak section which will be a point at which failure will begin under strain.

When working on the plane every precaution must be taken to prevent injury to the structure by using rubber soled shoes or shoes *without* nails. Screw drivers should not be carried in pockets or holders

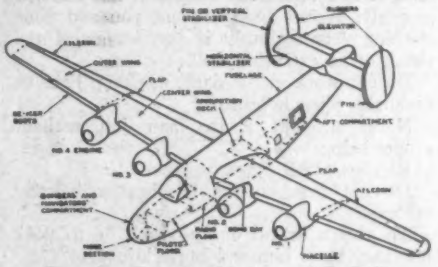


Fig. 3. Principal parts of B–24E

with the sharp end sticking out. When fastening equipment with tools, care must be taken to prevent slipping and damaging structure.

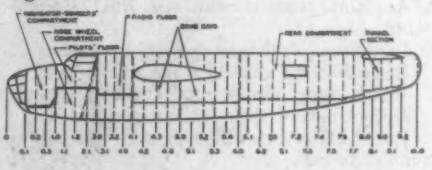


Fig. 4. Fuselage stations diagram

Things to Consider

The B-24-E is badly needed in our war effort.

It will take some outside work (homework) to be a good electrical installer.

Your work is esesntial to the proper prosecution of the war.

To waste materials is to aid the enemy.

Safety Rules

The best safety device is a *careful worker.*

No smoking in the school area at any time.

Go to the first aid with all injuries no matter how slight they may seem. Have your instructor or foreman issue a first aid card.

Wear goggles or shields whenever your eyes are in danger. Your eyes cannot be replaced.

Do not leave anything protruding into the aisles.

Running is prohibited.

No "horse play" is permitted in the plant.

Make use of all safety equipment at all times.

Wearing loose clothing or rings around machinery and equipment is dangerous. Keep sleeves rolled up and do not wear loose-hanging neckties.

Never try to operate a device that you know nothing about.

Do not carry screw drivers or anything that is long and sharp in your hip pocket, as serious injuries may occur to your fellow worker while he is trying to pass behind you.

Always turn off a machine when you are through using it.

Do not ride on the trucks unless you are the operator or helper.

Never look directly at an arc or acetylene welding flame. It might blind you or impair your sight.

There is one thing that must be remembered in aircraft work, and that is "perfect." Forget about the phrase "good enough."

When drilling skins or bulkheads, make certain that nothing is on the other side where you are liable to drill into it.

Remove all sharp edges from sheet aluminum or aluminum alloy after cutting. Hand injuries may occur when handling the metal later.

Always be careful while using an extension drill. It is a dangerous weapon if not handled properly. It can whip and cut you and your clothing very seriously if you let go of the shank of an extension drill.

Do not work in the dark, use drop light or flashlight when necessary.

Never attempt a two-man job without proper help.

Be alert at all times.

Do not lean on the benches or balcony railings.

To slap a friend on the back or to poke him may scare him and cause injury.

Do not spit on the floor.

Women must keep hair tied up at all times.

Always use a chuck key to tighten a drill in a motor.

Wear no toeless or fabric shoes. Safety shoes are advised.

Acquaint yourself with *Air Raid Regulations.*

Disconnect drill motors to change drills.

Disconnect air guns to make adjustments.

Watch flying clecos, sets, and chuck keys.

Do not borrow tools without permission.

Put drillings in drilling barrels and not in rubbish barrels.

If necessary to place aluminum in vice jaws, be sure the jaws have a protective covering.

Select the correct tool for the job you are undertaking.

Use care in handling materials. Avoid denting, scratching, or bending.

Work to dimensions at all times.

Constructive criticism is one way to learn quickly.

There are reasons for each operation. Be sure you understand them.

When learning a new operation, first see how well you can do it, not how fast.

Any center punching should be done lightly.

Report any equipment that is missing or out of order.

Always use proper terms for tools and parts.

Be free to ask questions at all times pertaining to material with which you are working.

Return all tools to the crib when you are through using them.

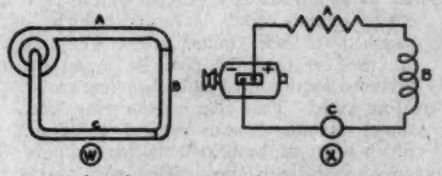
Waste neither material nor time.

Fill out tool breakage forms if you happen to break a tool.

When approaching or leaving a plane, *never under any circumstance walk under engines,* whether running or not. Death or certain injury result from being struck by revolving propellers.

Series Circuits

A series circuit has only one path through which the current flows. At W is shown a hydraulic series circuit and a corresponding electric circuit at X.



Hydraulic circuit and corresponding electric series circuit

As shown at W, the same number of gallons per minute of water must flow through all the pipes, because the water that flows through one pipe must also flow through the others.

Similarly, at X, the current that flows through the resistor must also flow through the coil and the lamp. The current through the three appliances is the same even though their resistances differ. At W the water leaves the discharge end at a high pressure and enters the intake end at a low pressure. Pipe A has little friction; therefore, the pressure drop in it is low, say 1 lb. per square inch. Pipe B has twice as much friction as A; consequently the pressure drop in B is 2 lb. per square inch. Pipe C has three times as much friction as A; therefore, the pressure drop in C is 3 lb. per square inch. The drop in pressure in the three pipes is 1 plus 2 plus 3 or 6 lb. per square inch, which equals the pressure difference or simply the pressure supplied by the pump.

Similarly, at X, the electric current leaves the positive terminal at a high pressure and enters the negative terminal at low pressure. A has little resistance; therefore, the pressure drop in it is low, say one volt. Coil B has twice as much resistance; therefore, the pressure drop in this coil is 2 volts. Lamp C has three times as much resistance; consequently, it has a pressure drop of 3 volts. The drop in pressure in the 3 appliances is 1 plus 2 plus 3 or 6 volts, which must be the same as the pressure supplied by the generator.

As shown at W, it is apparent that the total friction offered by the three pipes is equal to the sum of their respective frictions. Likewise, at X, the total resistance of the three appliances connected in series equals the sum of their respective resistances.

Current Measurement

To measure the flow of water through a pipe, a flow meter must be inserted into the pipe, as shown at Y, so that the water to be measured passes through the meter and causes it to indicate the flow in gallons per second.

An easy way to remember Ohm's Law is to draw a diagram as shown to the right. To find volts cover E (which represents voltage), and the result is I multiplied by R, where I represents current in amperes, and R represents resistance in ohms. To find I, cover I and the result is E divided by R or volts divided by ohms. The same method is used to find R.

Homework

1. Electric current flows from negative to positive or from positive to negative?
2. Electrical pressure is measured in what units?
3. Write Ohms Law 3 ways using the letters representing current, pressure, and resistance.
4. In which direction does current flow in a battery?
5. A cabin heater connected across 24 volts takes 12 amperes. What is the resistance of the heater?
6. What voltage is required to force 6 amperes through a 4.66 ohm coil?
7. A pressure of 24 volts will cause how many amperes to flow through a 4 ohm tail light?
8. What happens to an improperly fastened lug?
9. Current through a high resistance wire produces a great amount or a small amount of heat?
10. Can current be forced through the insulation of a wire under ordinary conditions?

Checking and Testing Circuits

All the circuits on the plane are checked *first without power* with a bell or buzzer set for continuous circuits and grounded circuits.

The best procedure is as follows:

1. Remove the fuse to the circuit and check the circuit with a buzzer set to determine if it is grounded or not, as shown at M in Fig. 6. If the circuit is grounded (a ground is any direct path from a conductor to the structure, except an electrical device itself which has one side grounded for a return) the ground must be cleared by breaking the circuit and testing each conductor for ground.
2. When no ground exists each conductor is checked from one end to the other for loca-

tion in junction box, *Q* strip, and the like, and also for numbering and harness. The

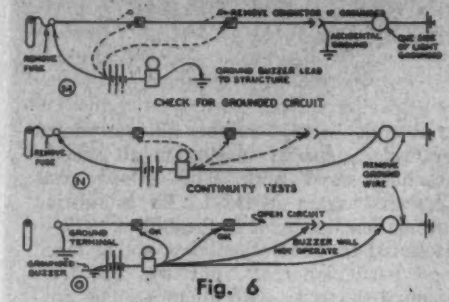


Fig. 6

procedure begins at the fuse and progresses to the device, as shown at N.

The buzzer will operate if the circuit is continuous, but will not operate in case of an open circuit. The fault will be found between the last point which tested continuity and the next point at which it did not operate. See diagram at O.

The foreman should be notified after the break has been located to determine the course to be taken to repair the fault.

When the circuit has been found to check with the schematic diagram the next test is made with the circuit livened up.

Electrical Blueprint Reading

Wiring Diagrams:

A wiring diagram is a diagram with the same conductors, electrical devices, connections, and numbering as on the straight line or schematic diagram, except that it shows the actual location of devices and wiring with respect to each other, as on a *Q* strip or junction box. Both the wiring diagram and the schematic diagram show the wiring and equipment exactly as they are connected. See Figure 7.

Wiring

Soldering: Special care is exercised in soldering lugs and connectors to conductors. Acid core *solder* is never used, due to the corrosive action of the acid on metals. The lug or connector is first properly tinned (coated with solder) by thoroughly cleaning the surface to be tinned with sandpaper, then covering lightly with

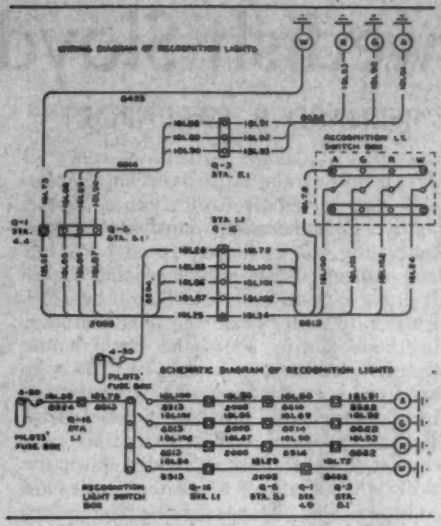


Fig. 7. Wiring diagram and schematic diagram

soldering flux, and then applying heat until solder melts on the surface. The complete surface is coated with solder and the excess solder shaken off.

The insulation is carefully removed from the end of the conductor with a knife or insulation stripper. The conductor is carefully cleaned and tinned, although the conductors are usually tinned by the manufacturer.

With the conductor and lug properly tinned, heat is applied to the lug and the lug filled with solder. The conductor is then dipped into the molten solder and withdrawn several times until the solder runs off the conductor, indicating that the wire is well heated. The conductor is then inserted into the lug as far as possible, making certain that the conductor is in line with the lug, and the heat removed. Additional solder must be added, since the solder will shrink down into the lug, to make a fillet around the conductor above the lug. The fillet is formed by wiping around the conductor with clean wiping rag, surplus solder being also wiped off at the same time. The solder will be drawn up between the strands when too much heat is applied. This stiffens the conductor for some distance from the lug, and increases the possibility of breakage. Also the conductor and lug must not be moved relative to each other while the solder is cooling, because the solder will part as it passes through the crystal stage. The solder will have cooled sufficiently when its surface changes from a shiny to a dull appearance. Good soldering can be rapidly done with a well-tinned soldering iron, since solder itself is a good conductor of heat. In time the tip of the soldering iron becomes oxidized and will not stay tinned, so frequent filing is necessary to keep it in first class condition. For close work between terminals the soldering iron is the most practical tool.

Soldering pots are used to excellent advantage for tinning and soldering large lugs to conductors, because of the larger heating capacity of the pot. Blowtorches are seldom used since the wide flame will burn the insulation on the conductors. Burnt insulation on one conductor is sufficient cause to reject the cable that the wire is in.

The lug and the conductor are now taped as close to the contact surface of the lug as possible in order to insulate the end of the conductor and give it a neater appearance. Insulating tubing (spaghetti) is used on smaller conductors instead of tape to insulate the conductors. The code number is fastened to the conductor just beyond the end of the insulating tape or tubing.

"What are we doing for the *early leavers?* — pupils who are within a few weeks of breaking contact with the formal processes of education. Some teacher in every school should busy himself to identify these individuals and to do something special for them in the remaining time, with utter disregard for curricular sequence and normal practices." — *Homer J. Smith.*

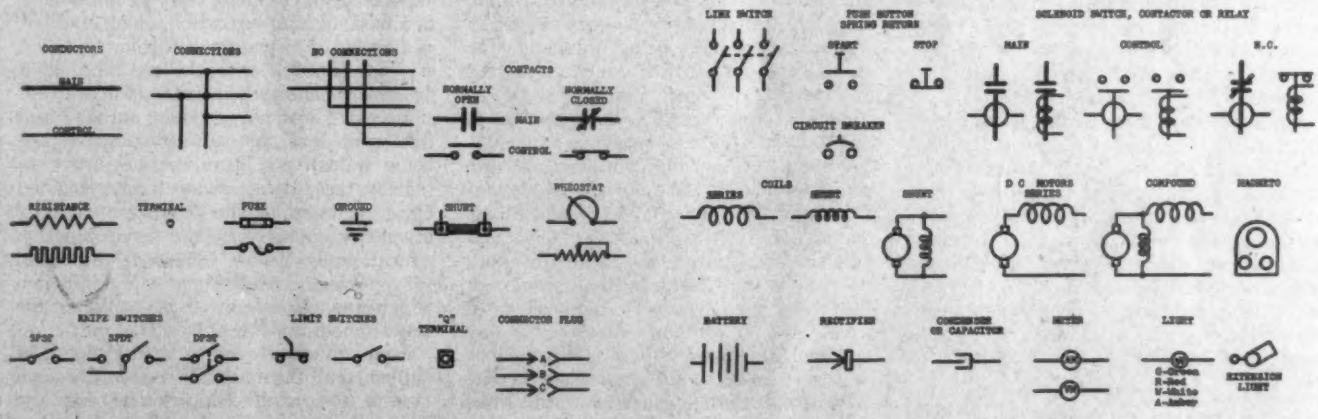


Fig. 5. Symbols used on electrical drawings of B–24E

Swedish Sloyd

BERNARD F. RAPPAPORT*

With industrial-arts work becoming increasingly popular in the schools of today, it is interesting to study the background of this field. To many students and teachers, the term *sloyd* applies only to the common knife found in every mechanic's tool chest, but, in reality, it has a richer and deeper meaning.

The word *sloyd* has a variety of origins. The root of the term may be traced back to the German *schlag*, meaning *a blow* and the Swedish *slå*, meaning *to strike*. Years ago, the use of the hammer was considered a type of skill or handicraft; and hence, the English term *sly* in the sense of dexterous, and the German *verschlagen*, meaning *cunning*, were derived. The old Swedish adjective *slög* means *handy* or *deft*, and from it comes the noun *slöjd*, or as we know it today *sloyd*.[1] In educational circles, the word *sloyd* implies a system of manual-training education, based on educational principles and whose aim is "the harmonious development of the pupil, during the formative age, giving him by manual exercises and the use of the creative instinct such general training as will tend to fit him mentally, morally, and physically for any subsequent special training."[2]

In order to really appreciate the development of Sloyd, we must first study the Swedish culture and pattern of life in the early nineteenth century. Sweden is a land of lakes, forests, and mountains. Beside the fact that this little country lies near the cold Artic region, and only a small portion of the soil is suitable for agriculture, the long winters and the few hours of sunlight each day let only the hardiest of cereals survive. In order to earn a livelihood under these conditions, the Swedes took on the characteristics of a hardy people — namely, they were strong, industrious, and economical. Prosperity without a capitalized wealth means the exploitation of the little natural resources that are available.[3] Living in this manner necessitates a rural population with the qualities of the Swedish people. Once these characteristics are lost, the power of Sweden is also gone.

Since the days of the Vikings, the life of the Swedish peasantry centered at the fireside during the long, dark hours of the northern winter. With the wide distribution of population and the difficulty of transportation, there was a need for physical and intellectual diversion; hence, the people turned to manual activities. It was here that these industrious people fashioned, with their own hands, all the needs of their house and homestead. The men whittled toys, furniture, and crude farm implements while the womenfolk made clothes for the family. "Sometimes they must work by firelight only — it is too costly to burn the lamp so long, for the winter evening begins at three o'clock and it will not be light again until nearly nine the next morning. In these shut-in hours the boy's hands and thoughts must be kept busy. 'The boys must be kept awake,' says the grandfather. By parent to child are taught these useful arts, and so from year to year, from generation to generation, is handed down the skill in handcraft, of which the Swedes are so proud. This picture of independent, busy home life was true of Scandinavia until the seventeenth century. Then began a gradual decadence."[4]

With the coming of the machine age, railroads were introduced which made the villages and towns less remote from each other; communication lines were developed; books became accessible even to the poorest; and farm machinery could be bought for very little money. Articles of farm and home requirement could now be had so cheaply that the average peasant would not spend his long evenings at his useful pastime, and the youngster no longer stood at his father's side so that he, too, could learn to use the knife. People now spent their time reading books or, as was more often the case, the men went to the town tavern and got drunk. It was not until the health of the Swedes had unaccountably fallen, and their moral and mental characteristics had been weakened, that people began to see the connection between these facts, and that throughout the land of Sweden, the skilled man, "the man deft of touch and quick of hand," was rarely to be found. Statistics of 1872 showed that in only 5 of the 24 provinces could the Swedish farmers make all their own wooden implements. This was a striking contrast to a century before when every man, woman, and child could contribute something to the house or homestead use.

These factors were being brought to the attention of the Swedish government at a time when, all over Europe, there was a revival of learning. This educational spirit centered on children *learning by doing*. With this trend on the continent, Swedish educators asked, "Why not revive Sloyd?" This query led to the establishment of many huss-sloyd schools, which were merely handcraft schools. Many of these institutions were in existence before 1844, but they were generally supported by private societies or individuals. This type of school continued to increase in number. However, in 1872, public pressure became so great that Parliament passed a bill which gave money to schools promoting industrial work. In 1877 another bill was passed granting a special subsidy to all schools teaching sloyd work. This subsidy was increased again in 1891. An interesting stipulation was made in the Bill of 1877 — it stated that the school was not to teach one particular craft, but was to stress manual dexterity with all tools. The government did not want to appear as in favor of one industry over another so they asked for a general education program through sloyd training.

Struck by the new movement, Herr August Abrahamson opened a work school for boys at Nääs in February, 1872, and two years later opened a similar one for girls, with his nephew, Otto Salomon, as director. Special importance was attached to modern subjects, like mathematics, drawing, and physiography; and seven hours out of ten were given to some form of sloyd — wood sloyd, turnery, wood carving, or saddlery — the corresponding subjects for girls being weaving, spinning, knitting, sewing, and cookery. In 1886 a mixed school took the place of the two institutions, but in 1888 the work of training teachers was growing so fast that the school had to be dropped altogether.[5] This school proved to be very important since it was the first teacher-training institution and many new teaching ideas and principles were developed there. This school became a meeting place of the leading educators of that time.

Salomon, a man with a moderate education, started his institution with practically no philosophy of teaching, and being a very practical individual, he did much study and research to help himself along. He visited other schools to get ideas and one of the high points of his career was his visit to Finland in the summer of 1877. His conversations with Uno Cygnaeus and his observations of the Finnish educator's school led him to two conclusions: (1) the importance of the elementary or folk school as a basis of later education, and (2) sloyd as a means of formative education. Salomon was not satisfied with the way the sloyd principles had worked out in Finland because there was no particular method and the work had not advanced above the home industries. Therefore, he strove to remedy these defects. One thing remained clear in his mind, and that was that only a teacher could make the sloyd program educationally useful. That was his basis for opening a teacher-training institution which was a strong attempt at making the sloyd school and the folk school one.

Upon Salomon's return from Finland, he subjected all the materials used in the sloyd system to certain educational tests and found that nothing was so well adapted as

*Brooklyn, N. Y.

[1] *Sloyd — Theory and Practice Illustrated*, by Gustaf Larsson.

[2] *Sloyd — For American Schools*, by Gustaf Larsson.

[3] *Swedish Sloyd*, by A. Farley.

[4] *Sloyd — As Adapted in Boston*, by Gustaf Larsson.

[5] *The Theory of Educational Sloyd*, by Otto Salomon.

wood for the purpose of formative education. From that time on, Salomon devoted all of his time in developing a system of woodwork based on scientific principles of education. It must be remembered that this system was not to turn out carpenters. Carpentry is a trade and the principles which underlie it are entirely utilitarian, whereas sloyd is solely a means of formative education. The aims of sloyd are:

1. To instill a taste for, and a love of, labor in general.
2. To inspire respect for rough, honest, and bodily labor.
3. To develop independence and self-reliance.
4. To train in habits of order, exactness, cleanliness, and neatness.
5. To train the eye and sense of form. To give a general dexterity of hand, and to develop touch.
6. To accustom attention to industry, perseverance, and patience.

To reach these goals, Salomon developed a series of 88 exercises which were to be made in a definite sequence. They began on a 12-year level and were to be completed over a course of four years. All the projects made under this system were useful. It is interesting to compare this with the Russian form of sloyd, where only exercises were produced which were of no practical value. Before a *model* could be put in Salomon's curriculum, it had to pass on ten criteria.[6]

1. All models should be serviceable in the house. The general principle was that the series of models made in the school should give the best expression to objects needed at home or in the district. Therefore, projects changed in different localities.
2. All objects of luxury — knickknacks — should be excluded.
3. All models should be capable of being finished by the pupil.
4. The projects should be made only of wood.
5. The objects should not be polished or stained. It was the contention that a job done well looked well and that pupils should not be taught to think in terms of covering up a poor job.
6. The objects made should require as little wood as possible. This was believed to teach the child economy.
7. The children should be taught to work in all kinds of woods.
8. Turnery and carving should be used very little.
9. Objects chosen should be such as will develop a sense of form.
10. All the exercises which the child is capable of making should be properly graduated and included in the series in due proportions.

The projects that were made had to be exact duplicates of the models set before the student. Dimensions that were off more than one thirty-second of an inch were not tolerated. The knife was one of the principal tools used chiefly because it was so common. It is from this tool that we get the common sloyd knife which is used a great deal today.

When we compare the aims and objectives of the sloyd system with industrial arts, we find them somewhat similar. However, when we compare the methods used by Salomon with our present concepts of education we find a difference as great as day from night. The sloyd system was supposed to teach self-reliance and initiative yet how could a child learn initiative if he had to make an exact duplicate of a previous model? The mind of the child was restricted to the sole thought of being able to copy something to exacting tolerances. It seems that this method would be an obstacle in the way of growth of the normal child. Under the sloyd system, there was a definite sequence of projects which the students must make. On the other hand, the modern industrial-arts student is allowed to choose his own project and even design one if he so desires. In industrial arts, the student is allowed to make improvements and personal adaptations of the models shown him which was taboo under the sloyd system. Today, in a youngster's first project, he is taught the use of a number of tools whereas in Sweden, and under the sloyd system, the first projects required using only the sloyd knife. Under the old method, pupils were not supposed to put a finish on a project, yet today, the finish is considered an essential step in the completion of an article.

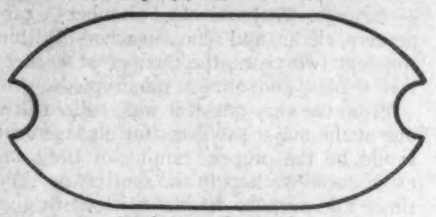
The aim of the sloyd system, as is the objective of industrial arts, is not to turn out carpenters and craftsmen, but to develop the child mentally, morally, and physically. Under both methods, the project was not an end in itself, but rather a means to an end. Looking back at the sloyd system, we see many things which we believe wrong. Perhaps in the future, educators will look upon our methods as all wrong, also. Yet, we must give credit to Otto Salomon and his Swedish sloyd system for giving us the fundamentals and basis for our present industrial-arts program as an integral part of general education today.

Two Typical Swedish Sloyd Projects

PACKTHREAD WINDER

Model No. 8 in Sloyd Series

Size: 3 9/16 by 1¾ in. Material: Birch



Packthread winder

Educational value:
1. Training in dexterity of hand
2. Cultivates observation through sense of touch
3. Training of eye in sense of form
4. Training in accuracy and neatness
5. Training in love of labor

Time: 3 hours

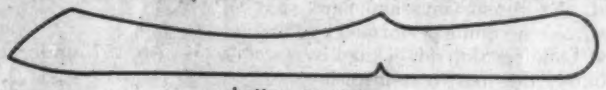
LETTER OPENER

Model No. 4 in Sloyd Series

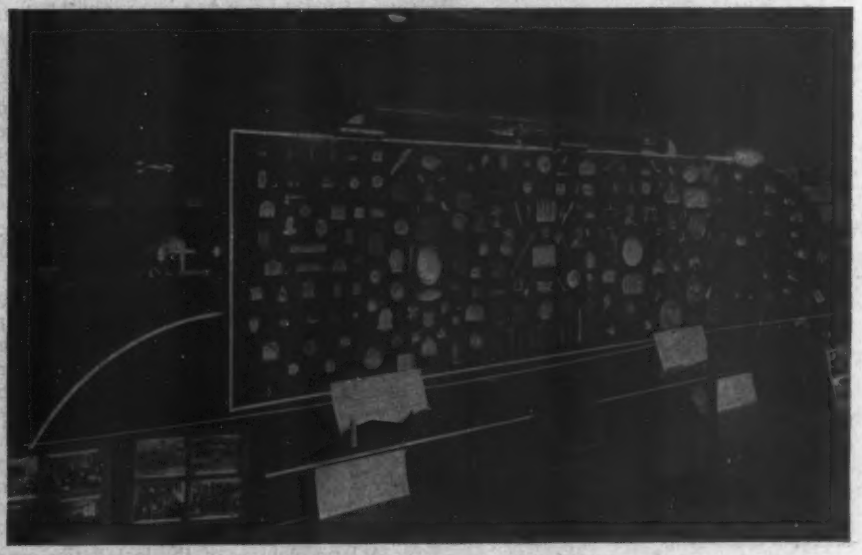
Size: 11 13/16 by 1 3/16 in. Material: Birch

Educational value:
1. Training in dexterity of hand
2. Cultivation of sense of touch
3. Training of eye in sense of form
4. Training in accuracy and neatness
5. Training love of labor

Time: 3 hours



Letter opener



Foundry work by students in Indiana schools
— Photograph submitted by Sylvan A. Yager, Indiana State Teachers College, Terre Haute, Ind.

[6] *The Theory of Educational Sloyd*, by Otto Salomon.

Training at the Prairie Shipyard

ROBERT BORRI*

In the spring of 1942, the Chicago Bridge and Iron Company converted a cornfield adjoining Seneca on the Illinois River into an embryonic shipyard. In a short time the number of employees totaled 3500 raw recruits from every walk of life — farmers, coal miners, plumbers, carpenters, clerks, and school teachers. Within the next two years, the number of workers was tripled and almost quadrupled.

From the very outset it was realized that one of the major problems for management would be the proper training of these inexperienced workers in the shortest possible time. The purpose of this article is to give a brief account of one of the most progressive training programs within this well-known productive organization turning out landing craft for the navy. It took many conferences, meetings, and much planning to get the organization mapped out. The first ship was launched in December, 1942, after almost six months of experimental building. In the six months following the first launching, the total man-hours required to build a standard LST were reduced to about one half. The hours have since been cut down to almost one third, so that now ships are turned out at a regular assembly-line rate.

Readers of the recent invasion news know of the stirring accounts performed by the LST. The Landing Ship for Tanks is, in all probability, the most awe-inspiring invasion craft of the war. It is a large, shallow-draft vessel over 300 ft. long with a beam of about 50 ft. While LST's were originally designed to carry heavy tanks, they are now put to numerous uses. The LST comes up to the beach, opens its massive bow doors, drops its ramp, and discharges equipment and personnel to lead a crushing assault on the enemy's territory. This ship is a modern wonder of the production line, and the fact that the navy gives the highest priority rating for the speedy construction of these vessels indicates how vitally needed they are on the war fronts.

The LST is an all welded ship, and many of its parts are prefabricated in other shops in different parts of the country and are brought by train to Seneca where they are hoisted into place by cranes and welded or otherwise fastened there.

Many of the parts or prefabricated sections are welded together on the ground near the ship or in parts of the yard devoted to preassembly work.

Another interesting manufacturing feature of this yard and one that saves time and lumber is the tack welding of light brackets to the ship's side and using planks on the brackets instead of erecting massive wooden scaffolds along the outside of the ship being constructed. See Figure 1. The brackets are easily removed from the ship and can be reused.

— Courtesy, U. S. Navy

Fig. 1. An LST under construction

The urgency to provide landing craft for our armed forces is evidenced throughout the shipyard, especially in the electrical department, which is responsible for the installation of all electrical equipment on the LST as well as for the maintenance of electrical power and light for the yard. This department has inaugurated a short-term, specialized training program designed to increase speed and efficiency of production.

On the first few ships, about 57,000 man-hours of marine electrical production work were required to complete one ship; at the present time, about 20,000 man-hours are needed to complete the same work. The reduction in man-hours is all the more unique when we consider the fact that the newer LST's have approximately one third more electrical work due to additions and alterations in equipment. Planned short-term training and specialized operations have contributed their share in the department's decrease in man-hours.

A large volume of the installation work of the electrical department is done by specialists in one of the several branches of work — lighting, power, intercommunication, radio, degassing, finishing and tube packing, cable pulling, materials, maintenance, welding, and layout. In every ship to be wired, there is a great deal of unskilled or semiskilled work; for instance, there are miles of cables to be pulled, thousands of holes to be drilled, numerous hangers to be mounted, where no all-round electrical skill is involved. Some operations, as installing control equipment, making hookups, testing, and trouble shooting, require higher skills and are done by journeyman electricians who have better all-round ability.

The different jobs require special training in varying degrees, and the training content is derived from a classification and analysis of the tasks. Among the better developed features in the electrical department are the courses in shop fundamentals and marine electricity, the electrician's handbook, personnel rating, trade tests, and foremanship training.

Shop Fundamentals

The shop prefabricates many of the brackets, hangers, and parts used to mount electrical equipment on the ship. The workers also process and assemble small equipment and perform those operations that are better done in the shop. Shop employees are given instruction in a short, intensive course in shop fundamentals. A training program is worked up in cooperation with the mechanical department, and students from both departments attend. See Figure 2. The ten units covered in the course include: (*a*) measuring, (*b*) drilling, (*c*) tapping and threading, (*d*) reaming, (*e*) hand hack sawing, (*f*) filing, (*g*) chiseling, (*h*) gasket making, (*i*) reading micrometer, (*j*) grinding.

The students receive instruction two hours a day over a two-week period. Part of the instruction is manipulative practice which is alternated with lectures and demonstrations. In this course, however, the related technical information is stressed by the instructor because each day the workers get several hours of practical experience in the shop.

Marine Electricity

a) *Layout Courses.* The 11 layout crews, meeting one hour each day, are given a three weeks' training course. The teaching material comprises five large units, made up of illustrated individual instruction sheets covering the various phases of layout — ship terms, measuring, marine math, layout procedures, and blueprint reading. The ideas, suggestions, and work procedures recommended by the engineers and supervisors of layout are incorporated in the instructional material. Oral

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explanations supplement the written instruction sheets, and appropriate questions are listed at the end of each unit to invite definite study of important features. Appropriate visual aids, such as, charts, models, and prints, are used to clarify instruction. Suggestions and contributions

– Courtesy, U. S. Navy

Fig. 2. Class in shop fundamentals

of class members are also encouraged. For each unit, a close check is made on the achievement of individuals and groups, and a final composite rating is derived as a method of comparison and as a part of a permanent record.

The following table shows the composite grades acquired by the workmen classified according to their occupational divisions.

TABLE I. Number of Employees in Layout Training and Grades by Groups

No. of Employees in Training	*Average Grades by Groups*
11 Subforemen	95%
32 Electricians	89
26 Electrician helpers	76
7 Electrician trainees	69
Total 78 employees.	Group average 82%

Table II shows the achievement of the various groups of employees; the scale of grades is an indication of the validity of the instructional material used, since the rank of each group turned out as would be expected, with the sub-foremen's group leading the list.

Data in this table correlate with the findings of other similar studies, that is, while an occupational group has a high average grade, some individuals of the trainee or helper groups rank higher than some of the lowest journeymen or subforemen. It was also found that 80 per cent of the employees received a grade of 70 or above, 10 per cent below 70, and 10 per cent were incomplete. A little over half, those receiving a passing grade scored above 90.

TABLE II. Grades Received by Various Groups

Grades	*Sub-foremen*	*Elec-tricians*	*Elec. helpers*	*Trainees*
Highest	98	99	97	97
Average	93	92	74	66
Lowest	82	73	17	35

b) Tube Packing. On each LST there are thousands of tubes through which electrical cable passes. These tubes must be packed properly so that they are watertight. Although the packing of them is not a difficult procedure, it is a time-consuming one. As the man-power situation became more acute, women employees were hired and trained to pack terminal and stuffing tubes.

Each prospective trainee was taken on tour of a ship where she saw the type of work to be done and the conditions under which she was to do it. In a few cases, the individual showed little aptitude for climbing or working on a scaffold. Such persons were referred to *personnel*. The remaining trainees were given individual instruction sheets with step-by-step directions for doing the job. Related technical information, such as ship terms, measuring, and simple fractions, was included, and ample opportunity was given for the practical application of the instructional material. Tubes were mounted on steel plates and the students packed, unpacked, and repacked them to build up their ability and confidence before being exposed to conditions on the job.

The progress of each individual has depended upon her own ability and industry. Performance rather than a set period of time has governed the completion of the course.

At first some of the tradesmen were very skeptical of the advent of women tube packers on the ships, but approximately fifty women completed training and went out on the job where their skill and conscientious application soon won the admiration of the most cynical old-timer.

Electrician's Handbook

The handbook is a summarized source of information taken from the designer's and electrical department's prints; it also includes practical shop data from other sources. The handbook has sections of general information as electrical safety, ship terms, and symbols, as well as more specialized information on procedures for doing certain operations. Included in the booklet are an explanation of the task numbering method used in the department, and pertinent information on the various systems, such as lighting, power, etc.

Copies of the book are available to electrical workers who are encouraged to broaden their understanding of the work

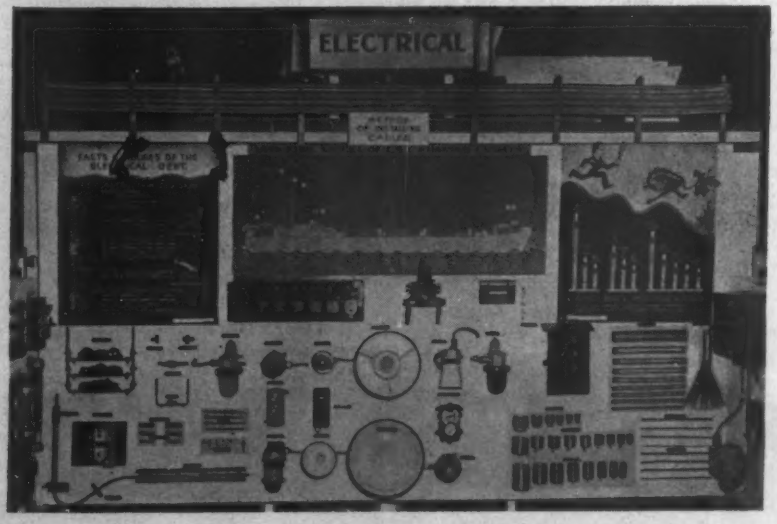


Fig. 4. Exhibit of equipment installed on the LST by the electrical department

— Courtesy, U. S. Navy

CHICAGO BRIDGE & IRON COMPANY

ELECTRICAL DEPARTMENT RATING CARD

BADGE NO. DATE

NAME

CLASSIFICATION

SYSTEM

STARTING DATE STARTING RATE

RATED BY

	EXCELLENT	GOOD	AVERAGE	FAIR	POOR
INTEREST	Enthusiastic	Interested	Mildly Interested	Indifferent	Poor
KNOWLEDGE	Detailed	Well Informed	Fairly Complete	Very Little	Inadequate
JUDGMENT	Mature	Good	Average	Fair	Poor
CONDUCT	Excellent	Good	Ordinary	Fair	Poor
CO-OPERATION	Excellent	Good	Average	Under Pressure	Poor
INITIATIVE	Resourceful	Makes Sug'ns	Occasional	Needs Urging	Poor
INDUSTRY	Ambitious	Active	Average	Needs Urging	Lazy
RELIABILITY	No Superv'n	Little Superv'n	Normal Superv'n	Close Superv'n	Unreliable
QUALITY	Outstanding	Good	Average	Fair	Poor
HEALTH	Vigorous	Good	Average	Frail	Handicapped

SKILLS

MARINE

Aloran
Banks, Radator
Batteries
Binnacles
Bosun
Compensating
Connection
Degaussing
Distribution
DK, 4X, 6X
Fuses
Radio Antenna
Equipm't Connect'n
Tags, Install
Trouble Light
Indicator Control
Buzzer
Cable
Lay
Measure
Pull
Serve
Strap
Tag
Capstan, Forward
Capstan, Stern
Chipper
Circuits, A.C.
Circuits, D.C.
Controls
Propulsion
Steering
Soaking Winch
Deers, Bow
Engineers
Co-ordinating
Drafting
Sketching
Fans
Galley Equipment
Generators
Ship's Service
Motor Generator Sets
Gyro Equipment
Kingpins
Lavoret
Lead Men
Lights
General
Running
Signal
Traffic
Material
Expedite
Identify
Order
Pack
Repair
Meters, Use of
Motors
Davit
Gyro Hood
Soaking Winch
Painter
Pumps
I. C.
Power
Test
Push-buttons, I. C.
Prints, Read
Circuits
Controller
Layout
P. A. System, Ship
Radar
Radio Equipment
Ramp, Bow
Ramp, Truck
Receptacles, Stry. Charg.
Refrigerator
Regulator, M. G.
Regulator, Voltage
Rubber
Safety
Salvage, Interpret
Switchboards
Battery Charging
Main
Switches
Alarm
Blackout
Fire Control Circuit
Magnetic
Preventor
Soaking Winch
Master Control
Temperature
Thermo-couplers
Telephone
Testing
Thermocouples
Trucking
Tubes, Install
Turret, Push
Welder
Welder, Tacker
Welder, Trainee

MAINTENANCE

Lighting, Installation
Power, Installation
Circuits, Locate
Clocks, Time
Compressor
Connections, A.C.
Connections, D.C.
Construction
Light
Power
I. C.
Hand
Inboard
Underground
C. P. Operator
Line, Hot
Line, Work
Meters, Use of
M. G. Operator
Pinning
Pumps, Bunnel
P. A. System
Refrigeration
Repair
Blower
Drop Cords
Electrode Holders
Gang Boxes
Motors
Panel Boards
Switchboards
Tools
Welding Machines
Ship, Maintenance
Splicing, Cable
Switchboards
Testing
Circuits
Clearing Grounds
Fuses
Insulation
Meters
Welding Machines
Transformers
Inspection
Tuning
Trouble, Shooting
Wiring, Temporary

SHOP

Assemble
Brass
Drill
File
Form
Grind
Layout
Material Handling
Pipe Machine
Punch
Hand
Machine
Set Up
Ream
Repair Machines
Saw
Hack
Hole
Power
Sharpen Tools
Steel
Stockroom
Straps, Make
Tap Machine
Tap, Hand
Tap, Machine
Tumbler, Operator

Fig. 3. Electrical department rating card

they are doing by studying the handbook in their spare time.

Personnel Rating

Employees of the electrical department are rated by their foremen every three months. The rating card, illustrated in Figure 3, is used. The subforeman rates his employee on ten qualitative items by marking *X* in one of the five quantitative columns. The various skills possessed by the employee are also checked from the skills listed on the rating card.

The foreman goes over each employee's card; and if, in his opinion, an employee's rating is not accurate, he rechecks with a red pencil in the proper column, then initials the card. Since the rating of an employee and the skills he possesses can be ascertained at a quick glance, the cards are kept for general reference purposes as well as for upgrading employees. The cards are considered confidential information and are filed in the superintendent's office.

Trade Tests

A definite testing program in connection with upgrading has been developed whereby several objective factors are considered in the selection and upgrading of an employee. Electrician helpers who have worked in the electrical department a minimum of ninety days are eligible to take an upgrading examination when recommended by their subforeman and foreman. The recommendation is submitted in written form outlining the man's qualifications and record. The examination for each branch is scheduled one day each month.

Certain weighted factors are considered in arriving at an employee's composite grade, such as trade test grade, personnel rating card score, length of service, and absentee record. If an employee takes the upgrading examination and his composite grade is below passing, he is eligible to retake the examination in sixty days.

A trade test for a journeyman rating usually consists of several parts, and each part is composed of new-type, objective questions which give a comprehensive sampling of the phase of work involved. It is possible to ascertain just where an individual is weak and where he knows his subject matter because an analysis or diagnosis of the performance of each individual on each part of the test is made.

Any question about the rating of an employee may be reviewed in the superintendent's office. Our recent data show fairly high correlation between ratings on trade tests and personnel rating of employees by foremen.

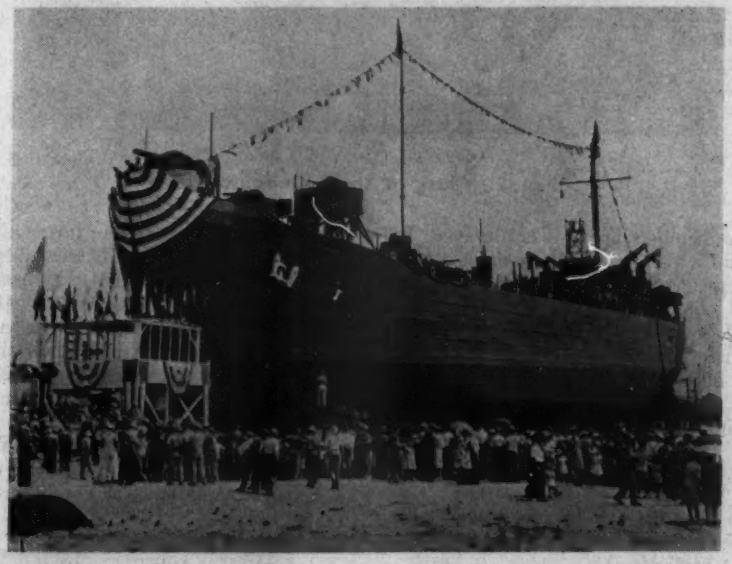


Fig. 5. Launching of an LST at the Seneca shipyard
— Courtesy, U. S. Navy

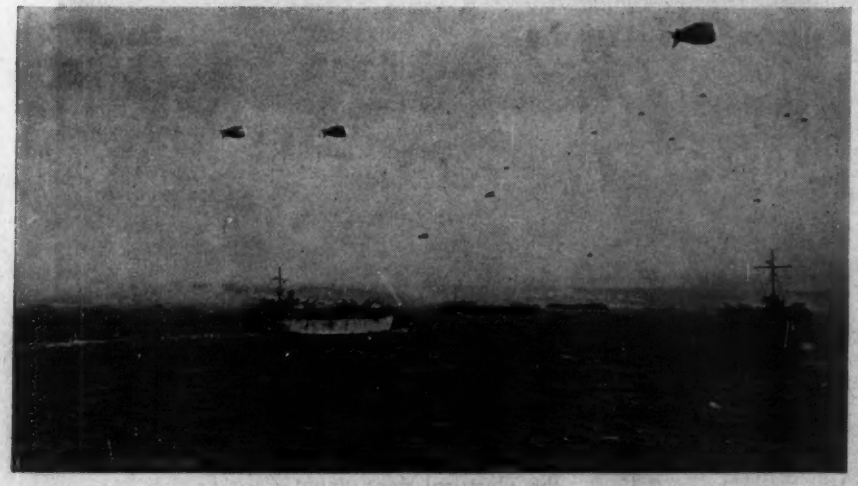


Fig. 6 — Courtesy, U. S. Navy

Foremanship Training

The department foremen attended the ten-hour training courses sponsored by the War Production Board, namely: Job Instruction Training, Job Methods Training,

and Job Relations Training. In addition, some of the subforemen attended courses sponsored by the electrical department as layout, tube packing, and safety. The electrical department and the safety department cooperated in conducting a safety training course for the 650 production supervisors in the yard. Through lecture and demonstration, proper handling of high voltage, artificial respiration and pressure points to stop bleeding, and the physical and human elements involved in electrical shock were covered.

Summary

Because of the large number of inexperienced workers who must be trained in a short time, the aim of the training program requires that a practical and direct approach be used. Preparing employees for the work they are to do and building up their confidence have resulted in less lost time and material during the first few months of the workers' employment. The development of the training program has brought about changes, but the fundamentals of the plan have remained the same, and changes made have been only a matter of refinement and elimination of nonessentials. A well-balanced training program meets the needs of various groups by offering suitable courses which are all tied together under a plan of upgrading.

Student's Job Plan

J. W. GIACHINO*

Any well-planned industrial education course to achieve successfully its desired goals must be guided by very definite functioning aims. These aims are analogous to guideposts since they lead the way to and keep in bounds the true course of learning. To help maintain this direction and secure the proper fulfillment of these aims, three important factors must be given due consideration and kept in constant manifestation throughout the teaching span of the course. These are:

1. Recognition of individual differences
2. Consideration of methods of instruction
3. Provision for judgment forming

It is axiomatic that there does exist considerable differences in the native abilities of students. Only when these dissimilarities are recognized and the necessary measures taken to compensate adequately for them, can suitable pedagogical methods be applied successfully.

Awareness of individual capacities brings forth the problem of the best type of instructional techniques for disseminating the course content for the mutual benefit of all. Since conditions vary so widely no stereotype pattern of procedure can be strictly followed. For one situation the best results may be achieved through one device, and in another instance an entirely different method will be needed. It is significant also that instructional procedures must be influenced by the nature of the material being taught. The contents of any unit will vary, and it is absurd to assume that if one method is successful in teaching a unit, the same system will be equally effective in teaching another. To follow a fixed routine without any apperception of the nature of the material is compatible with good teaching, and inevitably will result in failure even though it may not be immediately apparent. Good instructional methods must, therefore, acknowledge not only differences in pupils but variances in the teaching units themselves.

The third factor, judgment forming, with which we are principally concerned here, is perhaps, the most likely to receive less attention in all types of teaching situations. Many industrial-education teachers become so absorbed in training students for manipulative skills or in the consummation of certain jobs that there is grave peril of neglecting entirely the training for other desirable characteristics. It is not to be implied that acquisition of skills, information, or project making is not important. These have very definite functions but they should not be considered ends in themselves. This training will have greater value if it is integrated with a program that encourages the growth of various faculties leading students to apply more expertly that which has been learned. Therefore, there should be paralleling the so-called fundamentals of a course, opportunities which enable students to develop certain powers in visioning, planning, and appraising problems, all of which call for precise judgment forming. The acquisition of this trait needs stressing because the degree of success individuals ultimately attain is to a large extent in direct relation to their ability to form worth-while judgments.

One scheme that may be employed to give students experience in judgment forming is through the use of job plan outlines wherein planning of the work sequence for any job is induced.

The traditional method that is still in common existence is to pass out to each pupil a prepared sheet with explicit directions for completing a given job. The student is told from the beginning to the end exactly how to proceed, precisely when such and such an operation is to be performed. The entire thinking is done for him and he is left with just the pure mechanical operations to carry out. It is true that some of the more progressive instructors are giving students, usually in the upper grades, some opportunity to plan the construction of a project. It is the belief of the writer that all students, regardless of age, should be given that privilege. Such an idea may be called impossible and impractical by many, for how can an immature, inexperienced youngster form any judgment in planning such work. Granted that the students are incapable at the beginning to formulate entirely and correctly a plan of procedure, but is there any reason to believe that these individuals cannot be gradually taught to form judgments in making such plans? How much more meaningful and stimulating the task would become, and how much more valuable the finished product, if they are aware of their part in its planning.

The writer has for many years tried various outlines to help students carry out plans of procedure. A more recent form which has brought gratifying results is herein described.

Job Plan Outline

I. *Objective*

Under this heading the reason for doing the job is given. If all problems required for the course are to be purposeful they must have very definite objectives, which should be evident to every student. The logical place to inform him of the purpose for working the new problem is at the time when it is first introduced and not during the process of its solution. Stating the objective at this point will make a student inquisitive, and if his interest has been properly aroused, he will, undoubtedly, sense the need for learning the new material in order to apply it to the job. Here, he will say, is a new job, but if I am to perform it satisfactorily, I must learn something about this new element.

II. *Preliminary Study*

Next should come the assignment in which the source of material dealing with the new element is given. The directions are to refer the student to the best available references that describe simply and adequately what is to be learned. These references may be to operation, information, or assignment sheets which have been especially prepared for this course. They also may refer to books, or call for an actual lecture or demonstration by the teacher. In fact it may allude to any device that is the most appropriate for the new element.

*Western Michigan College of Education, Kalamazoo, Mich.

The directions for securing the necessary references should be very specific. There is nothing as discouraging to a student as to have to spend an endless amount of time seeking the source of information when he is anxious to get started on the job.

III. *Preliminary Job Planning*

When the student is equipped with the necessary knowledge, some means must be used to determine whether or not he has gained sufficient mastery of the new material to employ it on the job. Such a test should come before any actual planning of the work sequence is undertaken. At this point he is required to study and analyze his blueprint, to make preliminary calculations of what is to be done, and ascertain when and where the new operation is to be applied. It will be noticed that for this particular job plan outline, the test consists of a series of questions which serve as an aid to guide his thinking.

IV. *Tools and Machines*

The next step that calls for more concrete judgment forming is the selection of the proper equipment needed to complete the work. Here he must visualize the entire pattern of work in order to decide what tools, machines, and materials must be used to produce the completed article in the most efficient and practical manner.

V. *Plan of Procedure*

The student must now draw on all his resources and actually plan step by step the entire procedure which he expects to follow in completing the job. It is desirable that the instructor have available a master plan — one that in his judgment is correct for the job involved. The student can then compare his plan with the master plan and if differences are found, the instructor should give the student an opportunity to justify his variations. Usually some slight change in the order of procedure will occur, but if the student can prove that his plan is workable, he should be permitted to proceed according to his outline.

VI. *Appraisal*

1. Time — It is important for students to realize that the time factor in completing any work is very important. Industry considers it essential and since industrial education, whether general or vocational in scope, must depict industry as it actually exists, a close adherence to industrial practices should be followed. Consequently, the time element must receive careful consideration and students should be asked to keep a close check of the actual clock hours consumed in finishing the job, and a record of it made on his sheet. It is a good idea for the instructor to know approximately how long it takes the average student to complete the work. This fact may or may not be disclosed at the time the job is started. Any great variation between the student's actual construction time and the estimated time by the instructor needs to be given careful analysis when making final appraisal of the work. However, it is exceedingly important that the teacher give due consideration to the student's abilities so as not to be too discriminating because of his slowness. The factor of his individual capacity must be taken into account, otherwise, the appraisal will not be a just one.

2. Appraisal by Student — Encouragement of student appraisal is desirable to round out the complete cycle of judgment forming. If a definite system for checking any work is used by the instructor, such a marking scheme should be known by the student so that he can employ it as a guide in judging his work. Generally students will be found to be comparatively honest with their evaluation with a tendency to slightly underrate rather than overrate their work.

3. Checking Plan — Although the plan may have been checked at different levels, a final inspection of it should now be made by the instructor. It is imperative that all confusing points be clarified so that the student can start out with a plan that if reasonably followed will help him complete successfully the work that is started.

SAMPLE JOB PLAN OUTLINE
Job No. 6 — Air Scoop

I. *Objective*

The purpose of this job is to give you an opportunity to learn a new operation involving the bending of aluminum on the cornice brake.

II. *Preliminary Study*

Your first step in undertaking this assignment is to become familiar with the material essential to perform the new operation. This information may be found in the following instruction sheets:

1. Information Sheet No. 3 — Characteristics of 2S Aluminum
2. Operation Sheet No. 8 — How to Bend Aluminum on a Cornice Brake

III. *Preliminary Job Planning*

Make a very careful study of the blueprint for this job and then answer the questions listed here:

1. What kind of aluminum will you need for the job? .....
2. What is the thickness of material required? .....
3. What is the over-all width and length of the piece needed? .....
4. How are the various bends to be indicated? .....
5. What bending allowances will have to be made? .....
6. After what step in the construction of the scoop will this new bending operation be used? .....
7. Will any adjustments be required on the cornice brake to make the bend as indicated on the blueprint? .....
8. Why should a practice bend be made on a small piece of scrap metal before doing the actual bending? .....
9. What is the general bending order for the scoop? .....
10. What procedure do you plan to follow in cutting the 1-inch opening? .....

IV. *Tools and Machines*

List accurately the tools and machines that will be needed for this job.

1.	6. .....
2.	7. .....
3.	8. .....
4.	9. .....
5.	10. .....

V. *Plan of Procedure*

In very short sentences list the operating steps you plan to follow in doing this job.

1. .....
2. .....
3. .....
4. .....
5. .....
6. .....
7. .....
8. .....
9. .....
10. .....

VI. *Appraisal*

1. Date work started .....
2. Date work completed .....
3. Total time .....
4. Plan checked .....
5. Student's mark .....
6. Instructor's mark .....

Cabinet work produced in the industrial-arts shop at Sumner High School, Cairo, Ill., L. D. Jenkins, instructor

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

John J. Metz, Editor

The Successful Teacher

At the beginning of the school year it is well to dwell for a moment on some of the factors which make a teacher successful at his work. In doing this, it is taken for granted that the teacher is a master of the subject which he is teaching, at least up to the level at which he teaches it. Knowledge of subject, however, does not spell teaching success unless it is accompanied by many other factors.

It is trite to say that the teacher must have an appealing personality, a cheerful temperament, and broad sympathies. But he must possess these traits to a marked degree if he wants to be truly successful.

Most of us have had teachers who made little impression upon us because they lacked the friendliness which a cheerful, sympathetic person displays spontaneously. We may have even had the misfortune to have had a teacher who almost showed a positive dislike for his or her students as a whole. Those of us who have had such teachers still remember the intense dislike we had for their classes.

The teacher will do well to analyze his own personality traits, therefore, and if he discovers flaws, he must apply suitable remedies to correct them.

Another success factor which the teacher must not overlook is the value of enthusiasm. Wherever you find a class in which students are really accomplishing things, you will find an enthusiastic teacher. It is his enthusiasm which enkindles a reciprocal eagerness for his subject in the student. It may even be said that only the exceptional student will feel enthusiastic about any subject taught by a teacher who does not possess or evince some degree of enthusiasm for what he is presenting in his classroom.

Enthusiasm is what sells the subject to the student. Without it, students will get but a minimum out of the work which they are taking in a given class.

Of course, there are many factors to be considered when one speaks about a successful teacher, but those mentioned, when coupled with good common sense, will help any teacher to make better than a good showing in his subject.

Helping the Questioner

The young are hungry for knowledge, judging by the way children ask questions. Frequently these questions put the teacher into a tight spot. The right kind of teacher is not afraid to admit that he does not know everything. But the teacher who does have courage enough to say that he does not know the answer to a given question must not let that be the last answer lest he lose the respect of his pupils. Instead, he must get the right answer, if the question can be answered, and explain it before the class, to the one who originally asked it.

This is a much better way than to squelch the questioner by bluffing or by making sarcastic or ridiculing remarks.

Another good method, and one that is to be recommended to be used more than it is, is to refer the questioner to some book in the school-shop library, or in the general school library. This last method also may be used to circumvent the intentions of the student who would rather ask questions than answer those which the teacher of necessity must propound in the regular daily lesson.

No matter which method is used, it must always be done in such a way that the student is not discouraged from asking the legitimate questions which may arise while he is studying his lessons.

Apprenticeship for the Returning Veteran

According to a release from the War Manpower Commission returning veterans will have opportunities to enter trades through apprenticeship. This is a forward looking step in training these men for all-round trade competence.

The apprenticeship system of training when done under proper state or federal supervision has much to commend it. Under the present apprenticeship setup the instruction in the practical work is done in an industrial shop under actual working conditions. The learner, from the very beginning, finds himself to be a member of a group of workers. He is surrounded by skilled journeymen, who for the most part are quite willing to tell him all they know about the trade which he, as a beginner, is trying to learn.

The public vocational school, on the other hand, initiates the new indentured worker in the technical subjects of the trade, and teaches him to apply the mathematics and sciences which he may or may not have acquired from his former school attendance, to the special needs of the trade which he is striving to learn. All of this is designed to give the young tradesman a background which will fit him to do his future work as journeyman with efficiency and understanding.

The veterans also may receive additional preferential considerations not ordinarily extended to applicants for apprenticeship. Thus, according to present recommendations, the veteran's age would be considered the same as when he entered the armed forces as far as the indenture is concerned. Then also, the credit to be given an applicant for previous training or experience may be ascertained by practical tests. Furthermore, if any credit is allowed, the wage rate should be that of the level for which the applicant is qualified.

Vocational schools should be very much interested in this rehabilitation program and do their share in working with apprenticeship committees, employers, and representatives of labor, to develop suitable procedures for inaugurating this training in such a manner that returning veterans will derive the greatest possible good out of their training.

This same method of apprenticeship induction ought also be extended to embrace the younger workers who have done their part in alleviating the man-power shortage in the war-production plants. These youths have already acquired a part of a trade, and it would be well to capitalize on what they have and give them additional training to make well-equipped mechanics out of them.

If we can lead more people to design, construct, repair, finish, model, etc. — by reason of youth and adult instruction in the crafts and arts — we shall play an important part in individual and social reconstruction. Here, again, an incidental purpose of our work becomes an aim of higher magnitude. — *Homer J. Smith.*

Selected Articles on Industrial Arts and Vocational Education

WM. H. JOHNSON* and ISADORE M. FENN**

(Continued from page 318 of the October, 1944, issue)

January, 1943

A NEW TYPE VOCATIONAL SCHOOL, Arthur B. Mays, pages 5, 6.
A plea for a special school which would serve larger areas than the local high schools serve.

VISUAL AIDS QUICKEN THE LEARNING, Ralph W. Whalin, pages 8–10.
Advice to the instructor on how to make excellent use of the important sense of sight in many and varying learning situations.

TEACHING MATERIALS FOR INDUSTRIAL EDUCATION, Chris. H. Groneman, pages 55–57.
A list of teaching aids to help the teachers of various departments of industrial arts and vocational education.

February, 1943

EFFECTIVE TEACHING, Harry A. Pederson, pages 43–45.
Some practical procedures for effective teaching which are used by the best teachers.

VOCATIONAL TRAINING FOR DEFENSE WORKERS, R. B. McHenry, pages 45–47.
A broadcasting script.

RESPONSIBILITIES OF INDUSTRIAL ARTS IN THE PRESENT CRISIS, Stewart Scrimshaw, pages 51, 52.
An effort to discover exactly the responsibility of industrial arts in the present crisis.

TEACHING MATERIALS FOR INDUSTRIAL EDUCATION, Chris. H. Groneman, pages 55–57.
A continuance from page 18, January, 1943, issue.

March, 1943

DETROIT PUBLIC SCHOOLS IN THE WAR EFFORT, Earl L. Bedell, Walter E. Gleason, pages 85–88.
An article which shows how organized education is accepting responsibility for a great many functions in the national war effort.

INDUSTRIAL-ARTS EDUCATION IN THE WAR EFFORT, Louis V. Newkirk, pages 89–91.
The experience of the Chicago Bureau of Industrial Arts in its endeavor to be constantly on the alert to aid in every way possible with the war effort.

THE IMPACT OF HITLER ET AL. UPON PHILADELPHIA HIGH SCHOOLS, A. O. Michener, pages 91–92.
Philadelphia high schools in the war effort.

THE WAR PROGRAM OF INDUSTRIAL ARTS IN THE MINNEAPOLIS PUBLIC SCHOOLS, Clifford K. Lush, pages 92–96.
A full wartime program for industrial arts in the Minneapolis schools.

PREINDUCTION, PREAERONAUTICS, AND PRETRAINING, R. A. Radtke, pages 96, 97.
Training programs in which the schools are expected to take a very definite part in order that they may contribute their share in the war effort.

WAR AND THE INDUSTRIAL-EDUCATION PROGRAM, G. H. Silvius, pages 97–100.
An exhortation to teachers to plan their work to meet the needs of the youth in the American schools during the war.

PREFLIGHT TRAINING, Harry R. Wilson, pages 106–110.
An essay on the general service of aircraft, navigation, meteorology, civil air regulations, aircraft engines, aerodynamics, structure of aircraft, and radio.

A TECHNIQUE FOR THE WAR-PRODUCTION TRAINING PROGRAM, S. Joe Williams, pages 111–114.
A study of efficient operation of a war-production training unit.

A WAR-TRAINING MACHINE SHOP, G. H. Parkes, pages 115–116.
A new machine-shop training unit.

LAYOUT AND EQUIPMENT FOR A VOCATIONAL RADIO SHOP, Joseph Murri, pages 120–123.
A description of facilities for training learners for positions of construction, maintenance and operation of radio receivers, transmitters, power amplifiers, television and electronic devices.

COMMUNITY REPAIR SHOP, Louis M. Roehl, pages 123–125.
A treatise on the general repair shop in which may be done any one of the many repair jobs that arise daily on the farms and in the homes.

AIR NAVIGATION COURSE, Hugh J. Betts and Charles A. Browning, pages 127, 128.
An explanation of the course which has been designed to meet the needs of men who are to become pilots in our armed forces.

SCHOOL-SHOP SAFETY, H. W. Schmidt, pages 135, 20A, 22A, 25A.
A study in safety.

TEACHING MATERIALS FOR INDUSTRIAL EDUCATION, Chris. H. Groneman, pages 58A, 60A, 62A, 65A, 66A.
A continuance from page 57 of the February, 1943, issue.

April, 1943

TRAINING SCHOOLS ON NAVY PIER, CHICAGO, Lt. Comdr. Charles C. Caveny, pages 143–147.
An account of one of the nation's largest naval training activities which is housed in Chicago.

SIGNIFICANT REFERENCES FOR USE IN PROMOTING GRAPHIC-ARTS EDUCATION, R. Randolph Karch, pages 153–156.
A compilation of references.

EVALUATION OF TEACHING EFFICIENCY, Theron D. Gard, page 160.
Teacher's self-examination.

PERFORMANCE TESTS AND OBJECTIVE OBSERVATION, Einar E. Siro, pages 162–167.
An essay in which the author holds that performance tests and objective observation must be used to supplement written tests.

May, 1943

SUMMER EMPLOYMENT FOR INDUSTRIAL-EDUCATION TEACHERS IN ESSENTIAL WAR INDUSTRIES, Earl L. Bedell, pages 185, 186.
A discussion of the value of working in war industries from the point of view of industrial experience.

PROBLEMS IN RELATED INSTRUCTION, Benjamin J. Novak, pages 189–191.
Some of the problems in related instruction and a few of the practices followed by various vocational schools and educators.

A METHOD OF TEACHING AUTO MECHANICS, H. C. Seymour, Charles Sands, pages 194–198.
A method which has been developed in an Indian boarding school.

TEACHING MATERIALS FOR INDUSTRIAL EDUCATION, Chris. H. Groneman, pages 201–202.
A continuance from page 66A of the March, 1943 issue.

WRITING OBJECTIVE TESTS FOR SHOP INSTRUCTION, Frank C. Moore, William R. Mason, pages 203–206.
Suggestions for writing tests of the objective type.

June, 1943

SKILLED MECHANICS AND MODERN INDUSTRIAL TRENDS, Arthur B. Mays, pages 223–225.
New functions of the skilled mechanic and the need for making provision for his thorough training.

A LESSON PLAN, Lieut. Comdr. Edward B. Flaherty, pages 235–236.
A typical lesson plan, preparation, presentation, and test methods.

TEACHING MATERIALS FOR INDUSTRIAL EDUCATION, Chris. H. Groneman, pages 244–247.
A continuance from page 202 of the May, 1943, issue.

September, 1943

CONSTRUCTION OF WRITTEN ACHIEVEMENT TESTS, William J. Micheels, M. Ray Karnes, pages 269–274.

*Superintendent of Schools, Chicago, Ill.
**Chicago Vocational School, Chicago, Ill.

The presentation of basic principles and specific construction points to be observed and also the characteristics and requirements of a good test.

SOURCE MATERIALS FOR THE PRINTING INSTRUCTOR, Harold H. Kirk, pages 282, 283.
A listing of books which will be of much aid to the inexperienced man who finds himself before a group of youngsters for the first time.

OUTLINE OF GENERAL-SHOP PROGRAM, Alan B. Pawelek, pages 283–284.
A suggestive outline of a general-shop program for ninth grade students.

October, 1943

CONSTRUCTION OF WRITTEN ACHIEVEMENT TESTS, William J. Micheels, M. Ray Karnes, pages 307–312.
A continuance from page 274 of the September, 1943, issue. Matching classification, identification, listing, correct order, completion, situation, and essay tests.

DOES TEACHER TRAINING DO THE JOB, Lieut. Comdr. C. C. Caveny, pages 312–314.
Advice on preparing shop manuals, upgrading the quality of instruction, and building morale.

MORE ABOUT VOCATIONAL GUIDANCE, A. P. Twogood, pages 316–317.
Some concepts fundamental to an understanding of the subject.

November, 1943

INDUSTRIAL-ARTS OFFERINGS IN THE SMALL HIGH SCHOOL, Roy R. Van Duzee, pages 357–359.
Specific ways in which industrial arts meets the present and future needs of high school students and suggested courses for an industrial-arts curriculum in the small high school.

KAISER'S LOCALIZED VISUAL EDUCATION, D. T. Hoxie, pages 363, 364.
An explanation of the use of strip films for vocational education which have been localized by Kaiser Company, Inc.

A WAR TRAINING COURSE FOR TEACHERS OF GLIDER CONSTRUCTION, Lynn A. Emerson, pages 365, 366.
A summer training program for teachers who could be used for war-training classes established at Cornell University in the spring of 1942.

INDUSTRIAL-EDUCATION NEEDS AS SEEN BY INDUSTRY, Vernon Olson, page 368.
An assertion that there is a distinct job for the school — to train men and women to perform their task for the speedy winning of this war.

WARTIME WOODWORKING INDUSTRY AND VOCATIONAL TRAINING, Isadore M. Fenn, pages 373, 374.
An essay on the importance of the woodworking industry in this war and the War Production Training Program.

CONTRIBUTION OF INDUSTRIAL ARTS TO GENERAL EDUCATION, James E. Hopkins, page 375.
A recognition of the industrial arts as a vital curriculum area in the general educational program.

December, 1943

CRAFTS IN THE SCHOOL AND HOME, William H. Johnson and Louis V. Newkirk, pages 399–401.
A discourse on the broad craft opportunities for children provided by the Chicago schools through regular courses and through the craft clubs.

INDUSTRIAL-ARTS TEACHER TRAITS, Murray Lincoln Miller, page 401.
Some traits of good teachers and some traits of poor teachers.

A NEW INDUSTRIAL ARTS FOR A NEW DAY, Arthur B. Mays, pages 402–404.
An abstract treating of industrial arts in the years to come and what the future requires of industrial arts.

PREINDUCTION TRAINING IN THE SCHOOLS, Thomas Diamond, pages 408–409.
An explanation of preinduction training, what it includes, and how it may affect the existing program in the school.

THE GENERAL SHOP AFTER THE WAR, R. T. Craigo, pages 420–421.
A discussion of the general shop procedure as carried on at Dunwoody which may be of interest to those who are planning ahead.

(To be continued)

Teaching Materials for Industrial Education

CHRIS H. GRONEMAN*

(*Continued from page 314 of the October, 1944, issue*)

The following list of teaching aids was collated to help the teachers of the various departments of industrial arts and vocational education.

Many of the booklets and articles contained in this list have cost those who distribute them quite an appreciable amount of money. It is but courtesy to enclose sufficient postage with your request to cover mailing charges.

It is advisable that teachers use school stationery when writing for any of the items listed. All items are free unless otherwise noted. In most cases a small charge is made when free items are ordered in quantities.

Handicrafts

The American Crayon Co., Sandusky, Ohio
Everyday Art Magazine — $1 per year
The Second Stenciling Book — $1
Sketcho Oil Crayons
More Color For You — $1.50
Prang Tempera
Carvocast
Ambrite
Crayon Booklet
Directions for Using Textile Colors
Prang Water Colors
Prang Textile Colors
Prang Powder Tempera
No. 1. Problem and Idea Portfolio — $1
1 Educational Services
5–1 Stencilex Crayon Technique
6–1 Our Feathered Friends — Bird Projects
7 Some Blackboard Helps
11–1 Ideas for Fall
12–2 Good Health Activities
13–1 Making Friends With our Forests
15–1 Simple Holiday Gifts
18–2 New Projects for Spring
22–2 Patriotic Ideas and Designs
24–2 Variety in Wax Crayons
26–1 Fun with Easter Eggs
31–2 How to Do Modeling
36–1 War Winning Gifts
40–2 Articles From Waste Materials
48–1 Grade Projects With Painting Crayons
61–1 A Unit on Sea Craft
73 Short Cuts to Color
83–1 Color Combinations Made Easy
89–2 Fun With Poster Pastello
105–1 Holiday Designs and Ideas
133–1 Making a Farm Unit
148–1 Classroom Helps for Thanksgiving
149–1 Free Expression Fun
149 Pointers on Drawing
200 List of Books for Teaching Art
No. 2. Problem and Idea Portfolio — $1
1 Educational Services
4–1 Linoleum in Printing and Handicrafts
14–2 Silk Screen Printing on Paper and Cloth
16–2 Communications — Integration Unit
17–2 Drawing With Ink
19–1 Christmas Carol Designs and Borders
20–2 Gifts That Are Easy to Make
21–2 Know Your Flag
25–1 Make Your Own Christmas Cards
27–2 A Unit on Planes
30–2 Painting and Decorating Textiles
35–1 A Unit on China
38–1 New Carving Coloring Material
41–2 Famous Presidents
42–2 Silk Screen Printing With Tempera
44–2 Spring Art Ideas
45–1 Fascinating Effects With Sketcho Crayons
55–1 Linoleum Craft
64–1 Pointers in Poster Making

*Industrial Education Department, A. & M. College of Texas, College Station, Tex.

70–2 Vacation Fun With Painting Crayons
86 Crayonex Etchings
92–2 Projects With Water Colors
94–1 How to Do Stenciling
121 Using Transparent and Opaque Colors
122–1 Ideas and Designs From the Sea
135–1 Latest Helps in Crayonexing
137–1 Making a Mexican Market
139 Advantages of the Tuned Palet
151 Formulas for Craft Work
200 List of Books for Teaching Art
Prang Drawing Ink Folder
Modeling
Blackboard Bulletin
Silk Screen With Prang Tempera

American Handicrafts Co., 193 Williams St., New York City
Catalog of Craft Supplies
Instructions for Etching

American Type Founders Sales Corp., 200 Elmora Ave., Elizabeth, N. J.
Facts About the Printing Industry for Schools
ATF Art Units
Education Through Printing
Looks . . . Plus
No. 6–J General Shop Graphic Arts Unit
No. 12–J Ideal Graphic Arts Unit
No. 15–J Ideal Graphic Arts Unit
No. 20–J Ideal Graphic Arts Unit
No. 24–J Ideal Graphic Arts Unit
A Complete Showing of ATF Graphic Arts Equipment for Occupational Therapy Departments

Bakelite Corp., 30 East 42nd St., New York City
Bakelite Molding Plastics
Bakelite Laminating Plastics
Story of Vinylite Plastics
Vinylite Polyvinyl Acetate Resins
Bakelite Horizons
Road Maps to the Land of Plastics Research

Berkeley Models, Inc., 230 Steuben St., Brooklyn, N. Y.
Model and Aircraft Catalog No. 43 — 10c

Brodhead-Garret Co., 4560 E. 71st St., Cleveland, Ohio
General Equipment and Supplies Catalog

Comet Model Airplane & Supply Co., 129 W. 29th St., Chicago 16, Ill.
Manual for the Comet Wind Tunnel — 25c
Basic Principles of Airplane Control — 10c
Air-O-Trainer Kit — $1.50
Speed-O-Matic Models — $2, $1.50, $1, 50c, 25c
Scout Glider — 15c
Mustang Speed Glider — 35c

Craftman Supply House, Scottville, N. Y.
Mimeograph sheet of plastics

Dennison Mfg. Co., Dept. 522, Framingham, Mass.
Flower Making Guide — 5c
Party Table Decorating Guide — 5c
Guide to Gay Decorations — 5c
Craft-Work Guide — 5c
New Dennison-Craft Ideas — 10c
Gay Colorful Costumes of Crepe Paper — 10c
How to Make Crepe Paper Flowers — 10c
Gay Decorations for Parties, Dances, Banquets — 10c

William Dixon, Inc., 32 E. Kinney St., Newark, N. J.
General Catalog

Dow Chemical Co., Midland, Mich.
Saran Film
Styron
Dow Plastics
Dow Plastics Materials
Stripcoat
Magnesium Alloys
Styraloy 22

E. I. du Pont de Nemours & Co., Plastics Dept., Arlington, N. J.
Plastics
Some Worth-While Reading on Plastics
DuPont Plastics

Fellowcrafters, Inc., 130 Clarendon St., Boston 16, Mass.
General Products Catalog
Catalog 12A on Leathercraft
Catalog 11–CD on Plastics and Other Crafts
Training Diets

Gaylord's Library Furniture and Supplies Co., 29 N. Aurora St., Stockton, Calif.
Bookcraft
Organization of the Small Library
How to Use the Library:
1 to 10 — 10c each
10 to 50 — 9c each
50 to 100 — 8c each
100 to 500 — 7c each
500 and over — 5c each

J. L. Hammett Co., Kendal Square, Cambridge 42, Mass.
Industrial Art and Occupational Therapy Supplies

The Home Craftsman, 115 Worth St., New York, N. Y.
40 One Evening Projects — 50c
212 Exclusive Silhouette Designs — 50c

Industrial Arts Cooperative Service, 519 West 121st St., New York, N. Y.
Handbook and Catalog of Publications and Materials for Classroom and Industrial-Arts Teacher — 10c

Metal Crafts Supply Co., 10 Thomas St., Providence, R. I.
Art Metal in the Junior High School
Stones for Jewelry
Art Metal Materials
The Porringer
Gold As a Medium of Exchange
Camp Councilor and the Metal Crafts in Summer Camps
Summer Camp Crafts
The Spirit of Industry
Copper Work by Rose — $3.50
Jewelry Making and Design by Rose and Cirino — $10.25
Design in Metal, a portfolio by Rose and Smith — $3
The Nut Dish and Nut Scoop, a portfolio by Ziegler — $2
Paper Knives and Letter Openers, a portfolio by Ziegler — $1.50
Enameling by Rose — 80c

The Ohio Leather Co., 1052 North State St., Girard, Ohio
The Story of Leather

Plymouth Cordage Co., North Plymouth, Mass.
The Rope You Save Fights for You
14 Ways to Make Rope Last Longer

G. A. Pratt, 4133 Northcote Ave., East Chicago, Ind.
Pratt Junior Binder — $15
Pratt Bookbinding Unit — $53
Instruction Sheets in Bookbinding — 30c
Let's Bind a Book — $2
Bookbinding Supplies Catalog
Rubber Stamps to Order — standard

Rohm & Hass Co., Washington Square, Philadelphia 5, Pa.
Plexiglas Sheets, Rods, Molding Powders
Plexiglas Fabricating Manual
Plexiglas Price List

The Spool Cotton Co., 745 Fifth Ave., New York 22, N. Y.
Gifts — 10c each
Easy Ways to Sew and Save
Learn How Book
Quilts
Make and Mend
The Sewing Manual for Home Decorators
Sewing for Babies

Tanners' Council of America, Inc., 100 Gold St., New York 7, N. Y.
The Romance of Leather — 5c

Thayer & Chandler, 910 Van Buren St., Chicago, Ill.
The Idea Book

Woodcraft Equipment Co., Independence, Mo.
Archery Equipment
Syllabus on Archery

X-acto Crescent Products Co., Inc., 440 Fourth Ave., New York 16, N. Y.
How to Build Solid Scale Model War Planes — 10c
The Whittler's and Woodcrafter's Handbook — 10c
Twelve Technics — 10c
The Commercial Artists' Handbook — 10c

(Above booklets available to instructors free of charge with request written on school letterhead.)

(To be continued)

BOYS

Leonard E. Schmidt*

There's a kind of satisfaction
That you get when you're with boys,
And you can't buy it with money
As you can so many joys,
But you get it as you watch them,
It's a feeling so sublime,
And the nicest thing about it is,
It doesn't cost a dime.

Perhaps it is because I, too,
Was once a boy, and now,
Though years have passed, I can't forget
The one who showed me "how."
I recall his patience as he smiled
Amid our youthful noise,
And the pleasure that he seemed to get
Just being with us boys.

Yes, there are some boys you will meet
Who make you wonder why
You ever took up teaching,
Yet, as hard as they may try
They can't offset the fine ones,
Nor can they disturb your poise,
And you are happy at your job
Because you work with boys.

*Lincoln Hall Vocational Shops, Lincolndale, N. Y.

Some presentations (occupational descriptions) are dangerously incomplete. Some are so complicated as to be bewildering to those unacquainted with the field. Some may be characterized as general, subjective, bordering on sentimentality, and tending to the aim of recruiting. These criticisms suggest the extreme difficulty of preparing statements that are factual, comprehensive, and at the same time typical. Conditions vary so greatly among states and localities, and they are so constantly changing, that true and permanent portrayal is impossible. — *Homer J. Smith.*

Related Subjects— An Irrational Survival

H. BOODISH*

Someone once characterized the schools as being organized for convenience rather than for use. Although generally not true, there is basis for it, sometimes. All human institutions have a tendency to be weighed down by the inertia of conservatism and past traditions. It is only when what the institution represents is so much out of line with what is expected of it, and only when society becomes highly critical of it, to the point of rebellion, that the "pillars" of the institution, those that are its guiding light, begin to undertake the necessary changes. We may liken these periods of vegetative continuity and periods of change to valleys and crests of wave motions, the valleys representing the continuation of the status quo, and the crests symbolizing the periods of heightened criticism and change.

The passage of the Smith-Hughes Act in 1918 represents a crest in the wave motion toward education organized for use rather than for convenience. It was the culmination of the unceasing efforts of an ever increasing number of individuals whose philosophy of education was contrary to established traditions. The act gave final recognition to the need for a new type of secondary school, distinct and different in its main objective from the college preparatory high school — the vocational school. Although the curriculum of this new school was to be organized primarily to meet the needs of those children who could not profit by the regular high school education, then in existence, the philosophy of vocational education did not preclude the offering also of those phases of academic subjects which would help make the individual a more versatile and more proficient worker, as well as a generally more intelligent and useful citizen. To prevent a continuance of a strictly academic presentation of subject matter in name of vocational education, they were designated as "related subjects."

Twenty-five years have now elapsed since the passage of the Smith-Hughes Act. There is still no unanimity on the question of what constitutes related subjects. Most everyone has a general idea as to what is meant by the term, but when it comes to actual definition, it becomes elusive, and begins to assume different connotations, depending in large measure upon the individual's past experience, his ability at rationalization, and his general philosophy of vocational education. It is true, of course, that by their very nature words have the peculiarity of assuming different shades of meaning. In consequence thereof, it is often possible for one individual to derive meanings from words or phrases which others may not. Pragmatically, words or phrases have no meaning except those given them by usage. It is therefore fitting to examine such usage by persons who have written in this field.

"Technical, theoretical, or 'related subject' phases of vocational education include those readings, lectures, studies, and exercises in mathematics, science, drawing, and art, laboratory experiments, etc., which furnish organized knowledge of and practical insight into the so-called technical aspects of vocations. The technical studies appropriate to any vocation can only be determined by a study of the requirements of that vocation itself."

The above excerpt is from *Vocational Education* by David Snedden. It regards related subjects as those fields of learning which are of practical value in the pursuit of a vocation. In this sense, they are almost synonymous with the term technical subjects. A broad interpretation of what fields of learning they may include is, therefore, possible, since it is recognized that the breadth or narrowness of these studies would vary with their appropriateness to the particular vocation under consideration.

Dr. Walter H. Magill in his book *Administration of Vocational Education* presents the following philosophy regarding related subjects:

"It should be the function of the related subjects instructor to develop in the pupil those educational attainments which contribute to the development of a broadly trained worker, but do not enter directly into shop practice." Furthermore:

"The effect of proper related subject instruction is to produce a broader minded, more versatile, adaptable worker, better able to meet unexpected difficulties in vocational practice through an understanding of underlying principles and better able to adapt himself to changing employment conditions. . . ."

As can be seen, this concept of related subjects is broader and more inclusive. It includes relationship to shop practice, but goes beyond it. If the interpretation is correct, related subjects according to this concept should also meet the needs of several related vocations, and of life itself, as it is related to vocational living, thus enabling the individual to attain success not only in the vocation for which he was trained, but if need be, to attain better adjustment to any change forced upon him by changing circumstances.

The U. S. Office of Education, in Bulletin, No. 1, 1937, entitled "State Policies for the Administration of Vocational Education" writes as follows on the subject of related studies:

"Related subjects in the vocational program should include mathematics, science, economics, history, safety practice, hygiene, law, civics, and similar fields so organized and presented as to be directly related to the occupational needs and interests of the pupils. These related courses should be as varied and as broad as the needs of the students in preparing for all aspects of life adjustments which are influenced by the vocational relations of the worker."

The expressed purpose of this elaboration of related subjects, continues the Bulletin, is "to point out to those in charge of vocational education the possibilities of expanding the scope and enriching the whole field of related subjects.

"In determining what instruction other than shop instruction given in all day schools may be included in the term 'industrial subjects' for which salaries of teachers may be reimbursed in part from Federal moneys, the State Board must be satisfied that such instruction is inherent in the vocation taught in the school and is a subject which enlarges the trade or occupational knowledge of the worker. . . ."

Analyzing all three statements, we seem to be confronted with a paradox, in that on the one hand related subjects are considered as embodying those fields of study which would help to broaden the student's education, and on the other, as embodying only those limited studies that concern themselves with vocational proficiency and adaptability. This confusion as to the content of related subjects is shown in actual practice as revealed by the study made in 1938 by William E. Brunton, Assistant Director of Vocational Education in Philadelphia.[1]

Of the 13 states studied, Connecticut and Delaware made no distinction between related and general subject matter. Although the majority of the states did consider mathematics as a related subject there was little unanimity on the rest of the subjects offered in the vocational school curriculums. Furthermore, even where there is agreement, the actual content matter, if examined, would probably be far from related to the particular trades.

*Philadelphia, Pa.

[1]William Brunton, "Methods Used in Each of the Thirteen States in the North Atlantic Region to Provide Financial Assistance for Approved Instruction in Unit Trade Education."

The study further reveals that in many cases, whether or not a given subject would be organized as a related subject is conditioned in no small measure by the need or desire for federal subsidy.

The obvious deduction that can be made is that we have been too long in the valley. It is time to raise our heads atop of the crest and reorient ourselves. We must also be frank and honest, if our schools are to be organized for use and not for convenience. Frankly, as one educator put it, there is no such thing as "related subjects." There is mathematics, science, social studies, and English. But there is no such thing as related mathematics, or related science, or related social studies, or related English. Not any one of these subjects, even if they could be organized as purely related subjects, related to a particular trade, would probably cover more than several weeks' work at most, in their essentials. But the curriculum as now organized in some vocational schools calls for 3 years of related mathematics, 3 years of related science, and 3 years of related social studies, etc. If our thinking on this matter has been influenced and conditioned by our need for federal subsidization, let us make an appeal for the same for other reasons, but let us admit that before any one subject can be related to any trade or occupation, the individual pupil must first have a sound background in its fundamentals. We need not change our philosophy of vocational education to include in the vocational school curriculum, where necessary, a fundamental course in mathematics, algebra, geometry, English, science, history, and civics.

Although the seed is the same, the fruit may be different if planted in different soils and climates. So with the seed of vocational education. In one metropolitan area the introduction of vocational education through the vocational school evoked among some of its educators a feeling against the use of textbooks. In a way this was a natural reaction to the so called "textbook method of teaching" in academic high schools. It was also a corollary to the then existing conception of related subjects. In the shop the pupil was to work from an operation sheet. In class the teacher was to provide the related instruction. If the shop teacher could prepare operation sheets, why couldn't the related teacher prepare instruction sheets, or present the necessary facts orally? This philosophy grew out from the practice in continuation schools of presenting short printed units of instruction. On paper, it was an ideal setup. But there were two flaws. It assumed that the pupil had a basic background in the fundamentals of mathematics, science, English, and other subjects. It assumed that the teacher could write better textbooks than the professionally trained textbook writer. Although in isolated cases a teacher may have done or may do a better job than a professional textbook writer, on the whole, that is not the case.

This whole question of related subjects and the use of textbooks is very closely tied together. Although the primary objective of the vocational school is training the individual along a given occupational line, the school must meet the other important objectives of education: citizenship, command of fundamental processes, health, worthy home membership and proper use of leisure time. We must also be aware of the fact that in practice, not every student who enters a vocational school in preparation for a given trade follows that trade upon graduation or upon leaving school. It is highly essential, therefore, that whenever a student can benefit, provision should be made to give him the fundamentals of such subjects as mathematics, English, history, civics, etc. That type of student is on the increase in the vocational school. The writer has had personal contact with many students who selected to go to a vocational instead of a regular high school because they wanted to learn a trade, but they also wanted to receive a background in those academic and technical studies that would enable them to continue further in institutions of higher education. The cross section of the students attending vocational schools is not much different than that of those attending high schools. This was not the case when vocational education was organized under the Smith-Hughes Act. If there was or is a difference, it is slowly disappearing, as already revealed. The manner in which the academic subjects would be presented and the use of textbooks would naturally differ with the particular vocational curriculum, as it differs now in the high school, depending upon whether the student elects a commercial, academic, or industrial-arts course.

In conclusion, the following recommendations are in order:

1. Eliminate the use of the term "related subjects" or greatly liberalize its interpretation.

2. Eliminate the requirements of related subjects in vocational schools and substitute basic academic subjects (on the level of the student's ability and interest as indicated by his trade), but require practical application of subjects to the trade, where it exists.

3. Institute efforts to revise the interpretation of the Smith-Hughes Act on the part of state departments of education to grant subsidies for such subjects, as hitherto done for related subjects.

Paper-Bound Textbooks

JOSEPH CALLAHAN*

Proponents of a plan now being examined in New York and Boston point out that textbook costs can be reduced over 70 per cent if schools use paper-covered textbooks exclusively. This is a substantial saving because war has advanced the cost of new copies and rebinding old ones.

The use of paper textbooks to keep educational costs low is a centuries-old European custom that has not taken root deeply in American institutions. Most pocket-sized dictionaries, language guides, and classical literature series with paper jackets used in this country are for supplementing material contained in books with solid covers.

Cheap textbooks with material content identical to that of more expensively bound books have a valid place in educational programs, as they help to broaden knowledge perspective. The exclusive use of paper textbooks for reference purposes, however, may lessen the respect of students for their source material. Americans are constantly thumbing casually through newspapers, railroad timetables, theater programs, and political pamphlets which are soon laid aside carelessly or discarded. This habit of careless reading may be carried over psychologically to the reading of miscellaneous educational pamphlets. Concentration will not be easy. And concentration is required if the essential principles of a text are to be grasped and retained.

Emergency training programs are already rushing students "intensively" along the crests of specialized surface knowledge ripples in no way reflecting the motion of the sea underneath. Does a temptation for students to skim their books even more lightly make sense?

Several further minor but provoking difficulties arise for students whose entire library limps with paper or flimsy cardboard covers. The pages of such thick books are hard to flatten out for study without splitting the binding. Loose pages then fall out. Corners get curled, dog-eared and soggy, especially when the books are carried on a book strap through rain or snow. Moreover, a faded weather-stained paper-covered book hinders careful review work. A well-bound book, on the other

*Beachmont, Mass.

hand, may be personally prized and kept for reference even after having been abused.

The sudden preference of school and library systems for paper-bound books is not flattering to the systems or the people they serve. It is a simple matter to grade books according to condition and hold students or parents responsible for damage beyond reasonable wear and tear. A good textbook on history, the arts, and the fundamental principles behind all specialized subjects do not readily go out of date. It is profitable to keep the information intact, if only for comparison with later works.

When contents of a book must be constantly brought up to date, as in an aircraft manual, it is still not necessary to discard an entire book and get a cheap reprint from another source. New methods of design and construction may be covered by pages to be inserted in a solidly bound loose-leaf textbook. The student will then have a clearer, better rounded conception of his subject than if he ditched whatever he learned from one pamphlet and plunged in confusion into another.

Specialized technical education is particularly susceptible to the danger of focusing attention on knowledge offshoots at the expense of the main stem. Commercial schools find loose-leaf systems practical for keeping tab on new developments in office equipment, without throwing into the ash can the sound structure of office procedure on which all improvements are based. Is there any reason to think the industrial arts are wispy superstructures floating through space, or that they can be mastered by anyone with no more time or effort than that spent in reading a juvenile comic magazine?

The paper cover idea works for Europeans because they have to sweat through long, varied training programs where every means to knowledge — specialized or liberalized — is respected. If textbooks are to go continental, it is desirable first to acquire the broad European outlook. It is also well to realize first that cash outlays do not accurately forecast ultimate knowledge values, which depend primarily on the ability of individuals to learn. When these facts are more commonly understood, there will be less concern about textbook costs, and more about the waste of public funds for training programs not adapted to individual abilities or needs, or individual courses that are not properly planned.

Problems and Projects

ORNAMENTAL TIN CRAFT

CHRIS H. GRONEMAN
Industrial Education Department
A. & M. College of Texas
College Station, Tex.

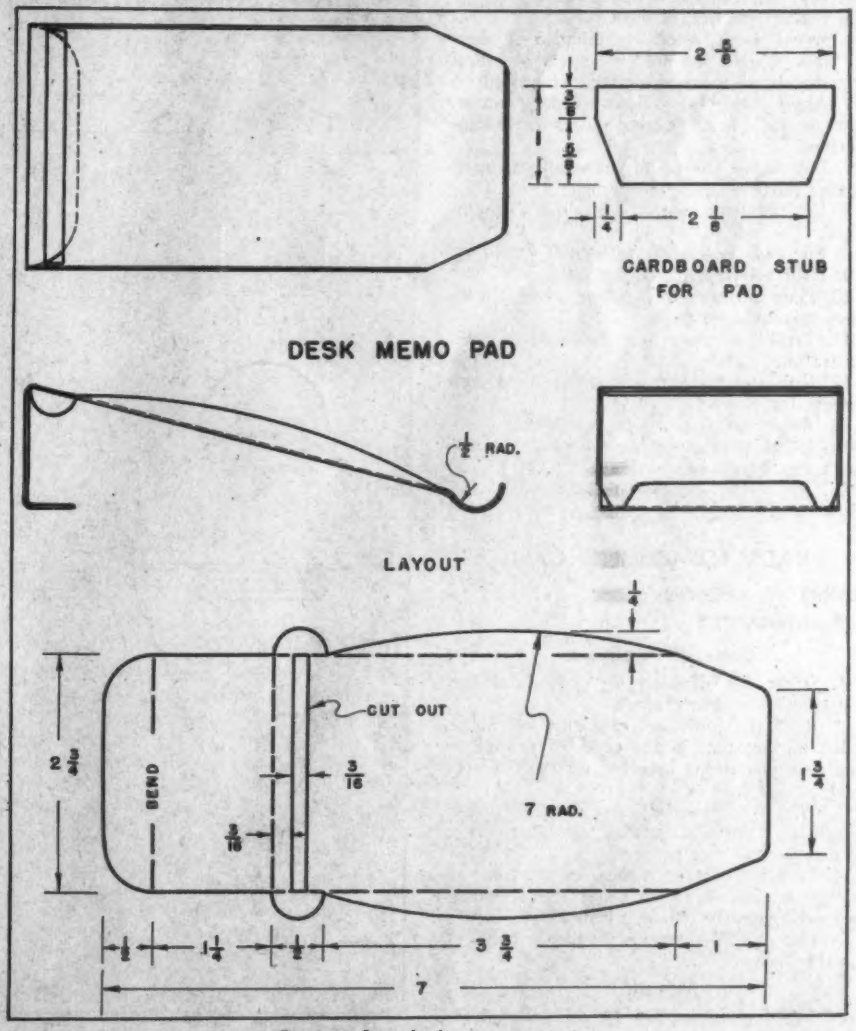
(*Continued from page 282 of the September, 1944, issue*)

Desk Memo Pad

The desk memo pad shown here is very useful. While this project involves considerable skill in laying out and cutting, it can be done sucessfully by the novice if care is exercised in cutting, bending, and hand forming.

The dimensions shown may be altered to suit the tastes of the most particular craftsman. It should be observed that two sheets of tin plate are sweat soldered together to give the desired stability when formed. It is quite essential that the two flaps at the ends of the cutout section be left on the design to assure strength. Only common hand tools are necessary for making this object. If the edges of the project should open up slightly after folding and forming, they can be touched up with the soldering copper without danger of

Desk memo pad



Design for desk memo pad

undoing the portion already sweated together.

The desk pad may be enameled or lacquered in any of the present-day novelty colors. In order to match the remainder of the desk set in copper finish, it should be copperplated by the process explained in plating the letter opener.

The pad can be made by cutting 25 or more sheets of typewriter paper 2⅝ x 4 in. These are to be stapled to a cardboard stub which is cut as shown in the upper right portion of the working drawing. The stub can then be slipped into the cutout slot.

Design A

No. of Pieces	*Item*	*Size*
2	Sheet tin	4 x 7¼
25 sheets	Typewriter paper	2⅝ x 4
	Solder, flux, steel wool	

Tools: Asbestos sheet, brush, carbon paper, copperplating setup, ⅛-in. drill bit, emery cloth, file, flat iron, hand drill, heating device, jewelers' saw frame and blade, lead or wood block, lead weight, peening hammer, pencil, rule, scriber, soldering copper, tempera water color paint — yellow, and tin snips.

Procedure

1. Make layout as shown in lower part of the illustration.
2. Cut out 2 pieces of tin stock.
3. Solder one side of each piece.
4. Sweat both pieces together with hot flat iron. Weight the soldered parts together immediately as more is sweated or heated.
5. Apply coat of yellow tempera water paint to one side of sweated pieces for design transfer.
6. Lay design sheet and carbon paper over painted portion and trace design.
7. Cut out desk memo pad holder with tin snips.
8. File and dress edges with emery cloth.
9. Drill hole and pierce for pad slot.
10. Peen surfaces on lead or wood block. Peen only exposed parts.
11. Bend and form as indicated in the illustrations.
12. Rub the project with steel wool and prepare for plating.
13. Apply thick coating of copper.
14. Polish project with steel wool. Do not touch metal with hands.
15. Apply coat of clear metal lacquer and allow to dry.

RADIATOR FILLING CAN

HARRY W. KROLL
Rockford, Ill.

General Directions

1. Study the drawing to understand the construction of the project.
2. Read the job sheet carefully and make a list of the steps in the order of procedure and new operations involved on the project-analysis sheet.
3. Watch demonstrations carefully. Ask questions if in doubt about the construction of any part of this project.
4. In place of the bottom construction, as shown on the drawing being used, double seamed joint may be made instead.
5. Cut out all the separate pieces required for the project.

Material

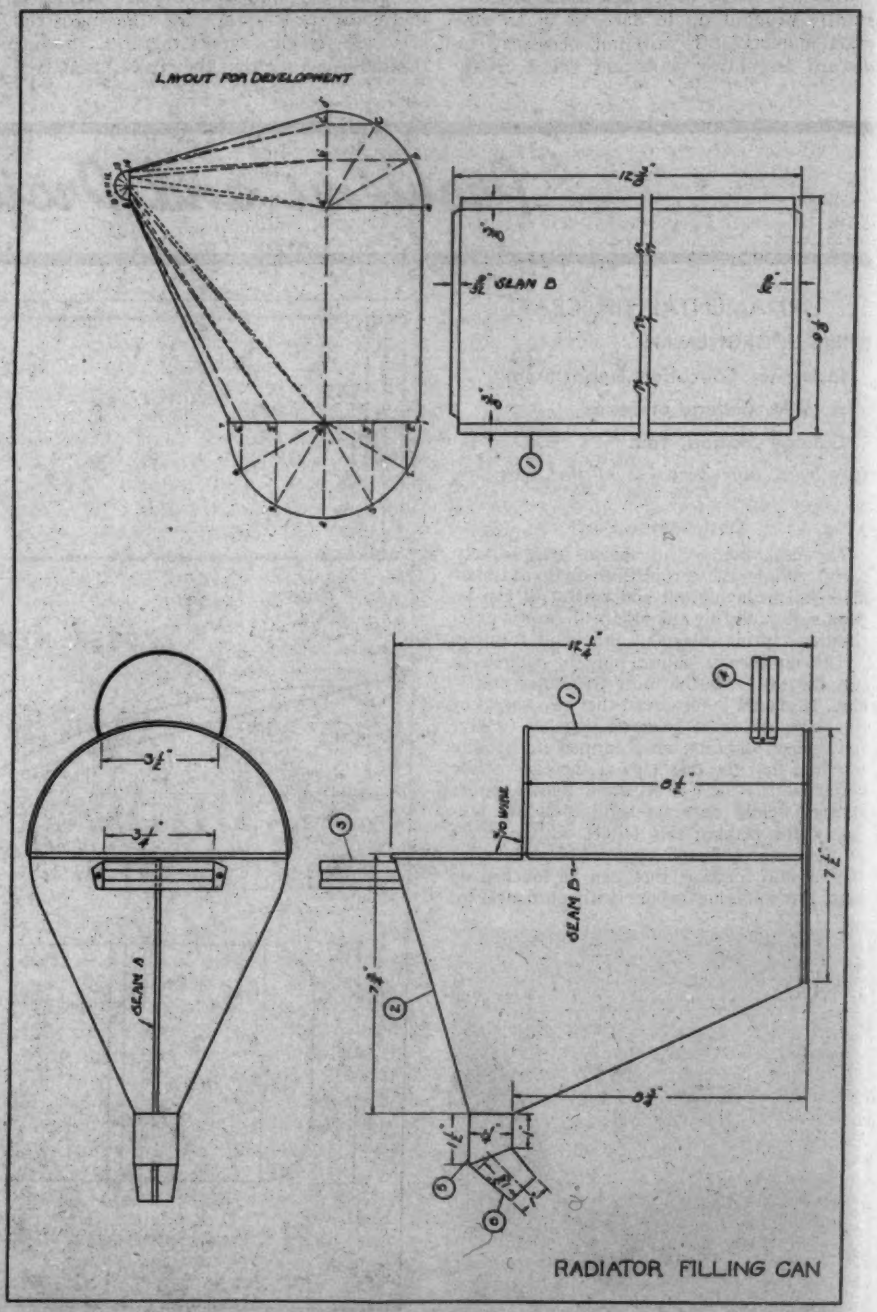
XX Tin plate or No. 28 galvanized iron. No. 10 wire.

Body

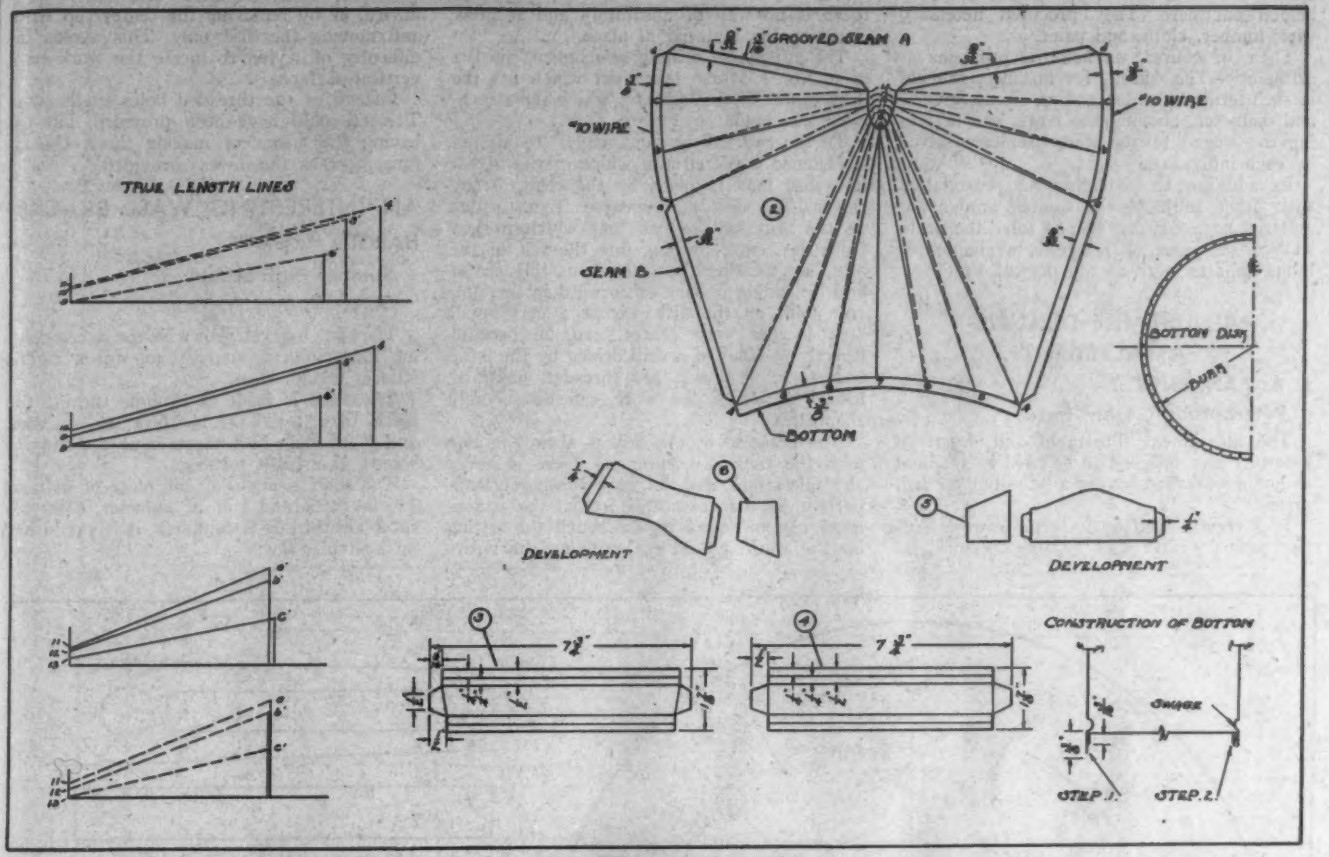
1. Piece No. 1. Fold the correct amount for the 3/16-in. seam at B.
2. Fold the upper edge of this piece to enclose a No. 10 wire.
3. Now enclose a wire equal to the length of the top edge and complete on wiring machine.
4. Piece No. 2. Fold the correct amount for the 3/16-in. seam at A and at B.
5. Form this piece over the mandrel stake and complete the seam at A. Use a hand or machine groover.
6. In the turning machine form the opening for No. 10 wire. Insert the wire and complete on the wiring machine.
7. Slip Part 1 and 2 together and complete seam B with a hand groover.
8. Set the turning machine preparatory to forming the swage as shown in the bottom construction.
9. Cut the bottom disk with the notches for a 3/16-in. burred edge. Burr up this notched edge with the machine.
10. Complete the construction of the bottom as shown in Step 2, by inserting in the burring machine and turning up the remainder of the ⅜-in. material on the body. Complete with the setting hammer.
11. Solder all joints watertight.

Spout

1. Form the two pieces for the spout with the grooved seams.
2. Enlarge spout piece No. 6 where it joins No. 5 and solder the joint.



Radiator filling can



Radiator filling can assembly

3. Slip piece No. 5 in place and solder securely.

Handles

1. Fold double hem edges on both handles.
2. Fit both handles to the body and rivet in place. Solder securely.

If desired, paint the container a suitable color, and have the instructor give the work a final inspection.

THE COVERED WAGON

E. E. SOHLSTROM
Public Schools
Portland, Ore.

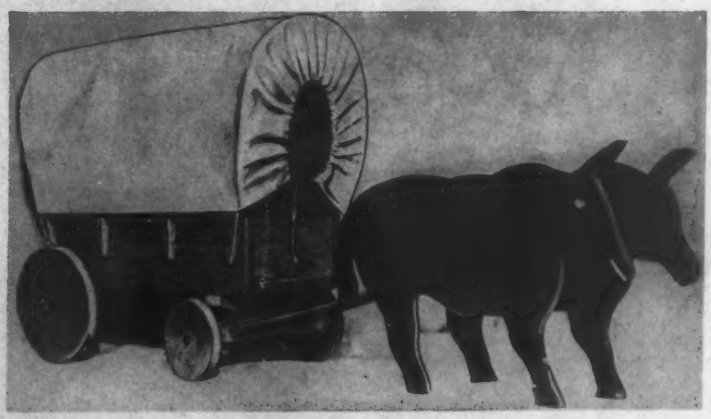
Nineteen hundred and forty-three was a memorable year at Vernon School for the sons and daughters of the rugged pioneers who crossed plains and mountains to settle in Oregon.

One hundred years ago these sturdy stout-hearted people came to establish themselves in new homes and a new country.

The Oregon Centennial was an important event. The covered wagon figured largely in all discussions of pioneer travel.

1. Interest in this project was noticeably great. The boys have definite ideas about the details of a covered wagon, having seen them on screen and stage.

A fair amount of liberty was given to incorporate their details. Water barrels, the hand brake, the hinged tail gate were a few ideas the boys added to the original model. The interest was so great even a motion picture show in the school auditorium had no attraction for these boys. They begged to be excused so they could work on their model.



The covered wagon

2. This project was not only a happy one to work on, it offered many training and educational values. The use of saw, hammer, plane, square, coping saw, punch screw driver, hand drill, tin snips and pliers, not to mention pencil and ruler, were used. Before the job was finished we had a lesson in painting.

Mothers helped with the covers but in a few cases the boys did their own sewing.

On this project, many of the students for the first time in their lives had an opportunity to learn the names of the parts of a wagon.

3. The trek of the covered wagon in 1843 ties in very closely with the history of the Oregon country.

Early Oregon history became a part of each lesson. While working on the project we talked of the pioneers and the hardship and the courage it took to undertake a venture of this character.

There was comparison between the covered wagon as a means of travel and transportation with steamboats, railroads, automobiles, and airplanes.

Many interesting facts were brought out in each class.

The solid wheels, which were used on the models, called attention to the fact that the first wheels used were cut from a log.

4. Problems of many kinds confronted us before and during construction. First, we had the usual worry about suitable materials, of which we had a limited amount. The boys

helped out here. They procured necessary wire, lumber, cloth, and paint.

Then, of course, we had the problems of arithmetic. The wheels, for instance, brought in such terms as center, radius, circumference, and diameter. Shaping the bows, and attaching the wagon tongue were problems solved by each individual.

In addition to providing fine correlation with other subjects, the limited amount of material necessary has helped solve the problem of shortages of materials available for industrial-arts work at the present time.

ADJUSTABLE DRILLING ATTACHMENT

J. A. BANNISTER

Peterborough, Ont., Can.

The attachment illustrated and described herewith was designed to be used in a school or home workshop having a lathe but no drill press.

It is very difficult to do accurate work with the ordinary drill pad in the tailstock, as there is no way of accurately and securely clamping the material in place.

The adjustable drilling attachment consists of a No. 2 Morse taper pin which fits the dead center of the lathe for which the attachment was made.

To the end and at right angles to this pin is fastened a slotted arm which carries a cast iron disk held in place by the clamp screw shown. The disk is prevented from turning on the arm by the two lugs which project from the center bushing into the slot of the arm. By rotating the disk about this center and by sliding it back or forward in the slot, any point on the disk, except a very small area in the very center, can be brought directly in front of a drill driven by the lathe headstock. The disk has threaded holes by means of which the work can be securely clamped.

The pressure of the drill is always in line with the tailstock center, so there is never any side strain, and the work is securely supported. Another advantage is that the attachment can be taken to the bench for setting up the work, either by removing the entire device, or by removing the center cap screw and moving the disk only. This avoids the difficulty of trying to locate the work on a vertical surface.

Instead of the threaded holes in the disk, T slots could have been provided, but not having the means of making these, the arrangement as shown was provided.

AN INTERESTING WALL BRACKET

HAROLD M. GRAY

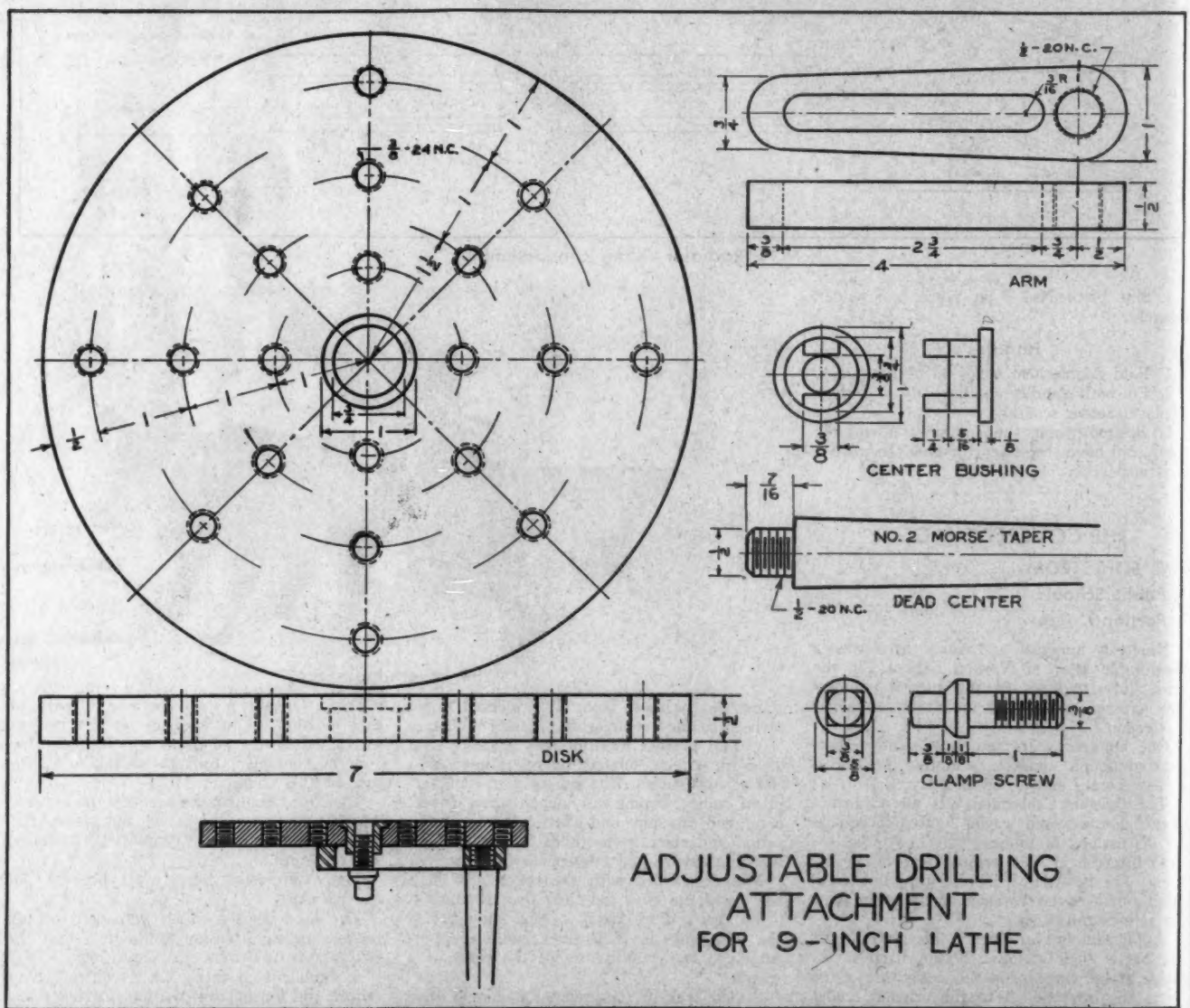
Sumner High School

St. Louis, Mo.

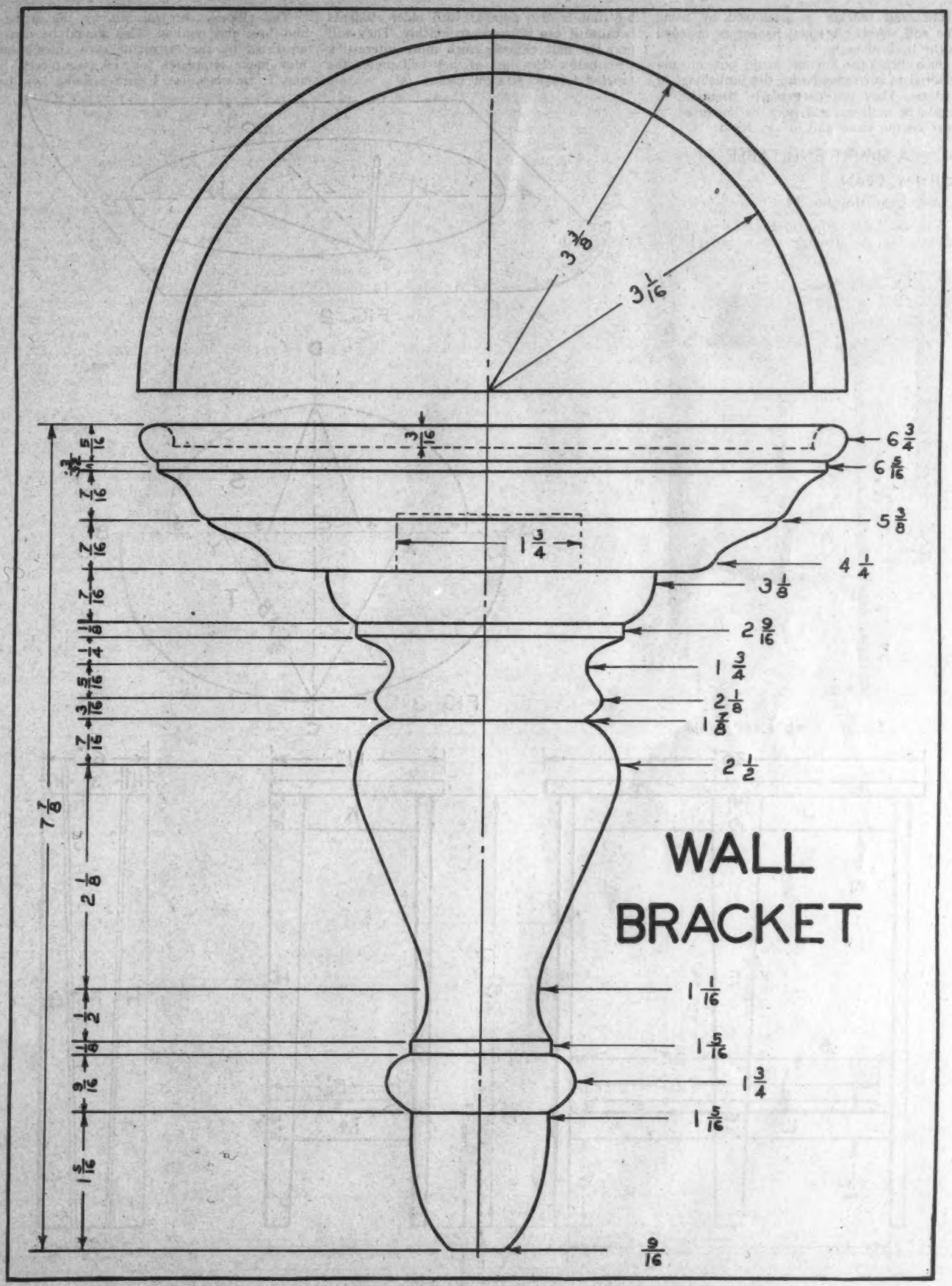
The wall bracket shown in the accompanying illustration is an easy job for a careful student or craftsman.

The stem is made by spindle turning two pieces of material 1¾ in. thick, 3½ in. wide, and 9 in. long, held together at the ends by screws as in split turning.

The shelf is made of one piece of material 1½ in. thick, and 7 in. in diameter. After this faceplate turning is complete, it is cut in half on a circular saw.



Drilling attachment for the lathe



Wall bracket designed by Harold M. Gray, Sumner High School, St. Louis, Mo.

The wall bracket is assembled by using glue and screws. A metal hanger is fastened to the back of each.

Such brackets can be made out of any material to correspond with the furnishings of a room. They are particularly beautiful in maple or walnut, and may be mounted in pairs on the same wall in any room.

A SIMPLE END TABLE

JOHN W. DEAN
Arlington Heights, Ill.

The end table shown in Figure 1 is simple enough for the average junior high school boy but is also popular with older students because it can be made so quickly. They will find the half ellipses much more interesting than half circles just as they will prefer the tapered legs to straight pieces.

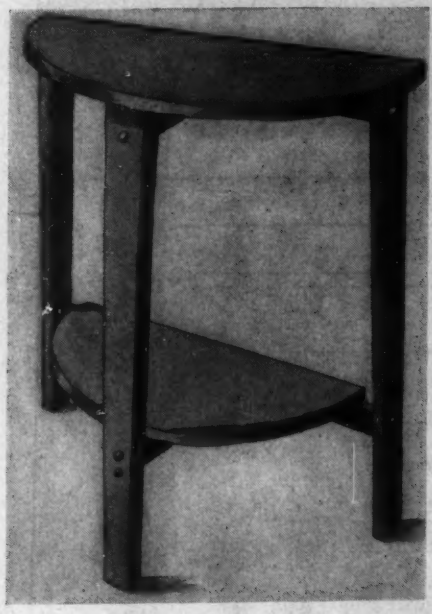


Fig. 1. Simple end table

The ellipses are laid out by the string-and-three-pins method. This should be demonstrated by the instructor even though he may make templates for the two pieces, S and T, for class use. Figure 2 shows how to

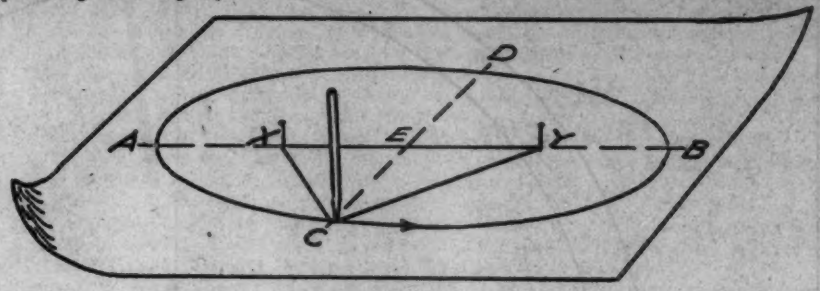


FIG. 2

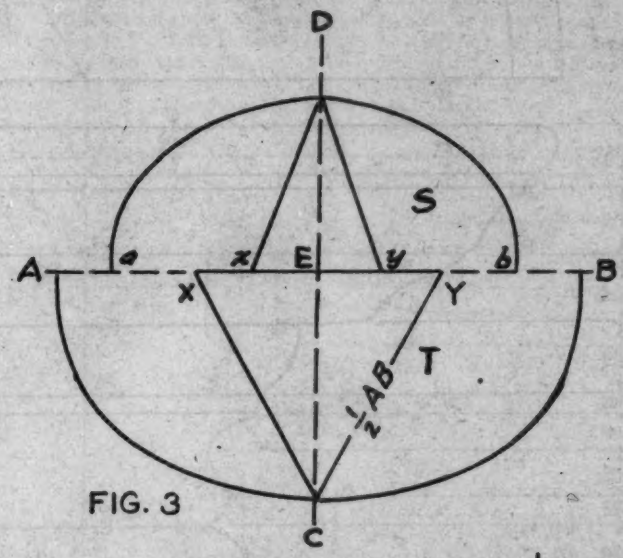


FIG. 3

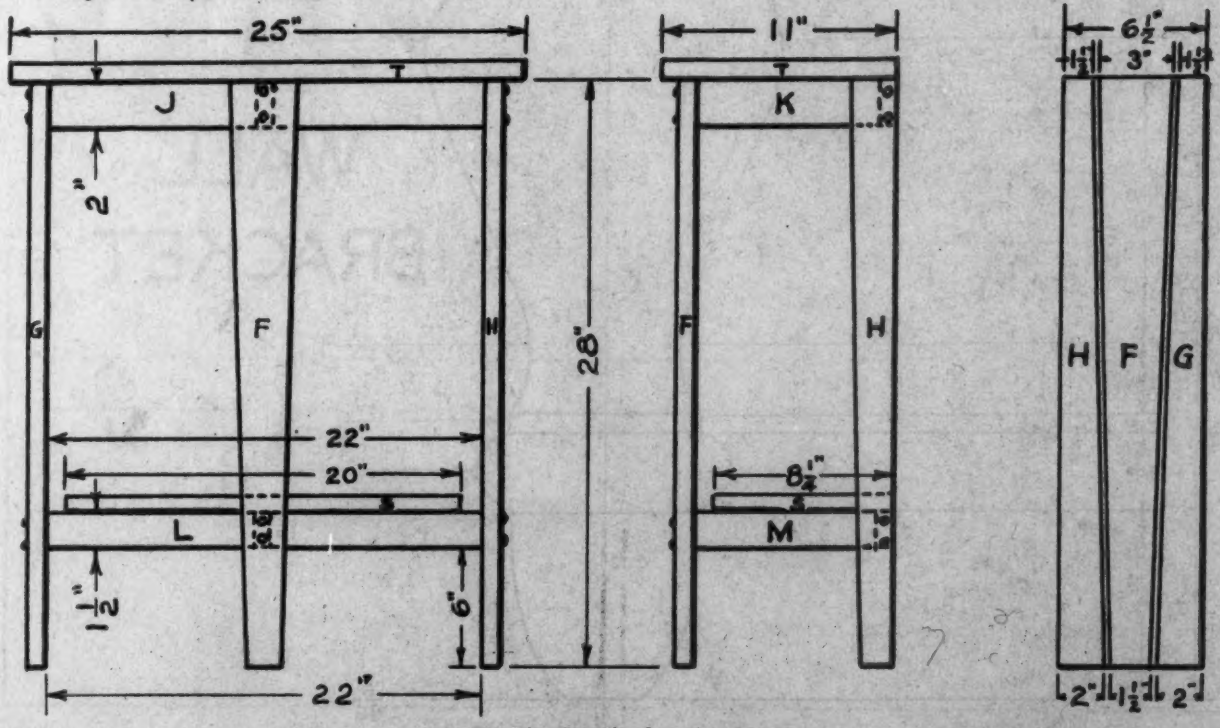


Fig. 4. Detail of end table

draw an ellipse and Figure 3 shows the complete ellipse for either piece. On a large sheet of paper, draw the long and short axes of the ellipse desired, AB and CD, bisecting each other at right angles. The ellipse has two foci on the long axis. Locate them by taking half of the long axis AB (AE or BE) and using it as a radius with C as a center; swing it and cut the axis at X and Y. Drive pins in the points X, C, and Y and tie a loop of hard (nonelastic) string firmly around the pins. Start with a slip knot, draw it tight and tie the two ends into a hard knot. Remove the pin at C and replace it with a pencil having a little notch cut in the wood near the point to keep the string from slipping down. Swing the pencil around through the points ACB and it will describe a half ellipse. Of course, this may be done directly on the underside of the board after the procedure has been learned.

Saw the shapes carefully on the band saw and smooth the edges with a spokeshave rather than a wood rasp. Clamp the piece edgewise in a vise and *scrub* the edge with sandpaper wrapped around a narrow block, held by both hands, until no saw marks show and the wood takes on a sort of natural polish.

The three legs should be made from one piece 6½ in. wide and about 28 in. long. The detail to the left in Figure 4 shows the layout of the legs allowing ¼ in. between for sawing and planing. If more than one table is to be constructed it will pay to make a jig by cutting a piece like one of the side legs and nailing a strip of wood about 3 in. long on one end. This is to make it possible to push the jig and board along the fence of the circular saw together, making a diagonal cut along the edge of the board yet parallel to the fence. If the board is the right size it will not be necessary to draw the lines on it except to prevent making a cut in the wrong place.

Figure 4 shows the upper braces to be 2 in. wide and the lower ones 1½ in. wide; J and L are 22 in. long, K and M are about 9 in. long, depending on the precise location of F. Ordinarily, these pieces would be fastened together with screws and attached to the pieces S and T with flathead screws, counterboring just enough so that the points would not go through. A much simpler construction will be with 8d and 10d finish nails, driving the heads just flush with the surface of the wood and sanding them smooth. Start the nails into the second piece just enough to mark the location of each and apply a little glue to the joint. Driving the nails in after gluing makes it unnecessary to use clamps while the glue dries. Nail K squarely to the middle of J with two nails, and do the same with L and M. Locate JK on the bottom of T and nail it in place from the top; likewise for LM under S.

Next, nail the legs F, G, and H to JK and LM, first with a single nail; then test for squareness and drive in the second nail at a slight angle so they will not pull out so readily. Lastly, drive additional nails through the top T into the tops of the legs, taking care to miss those already driven through the legs into JK. Apply stain, varnish, etc., in the usual way. Cover the nailheads in the legs with harmonious upholstery nails by way of decoration, and drive a steel glide into the bottom of each leg.

You will find this table very satisfactory as a telephone stand in places where square corners would be inconvenient.

BOY'S TOOL CHEST

JOSEPH KUNSMAN
High School
Ambler, Pa.

Every boy interested in tools also is interested in having a tool chest of his own. The chest shown here is simple to construct and has adequate room for the basic woodworking tools. Its size and weight make it easy to carry about.

The same design could also be followed in making a real carpenter's chest. The length of the box should be determined by the length of saw or saws which are to be stored away in it.

Boy's tool chest

The chest shown in the drawing is constructed of ½-in. western yellow pine. The following pieces of stock are required:

Sides	2 pcs.	½ x 8½ x 21¾ in.
Ends	2 pcs.	½ x 5¾ x 9 in.
Top and bottom	2 pcs.	½ x 5¾ x 21¾ in.

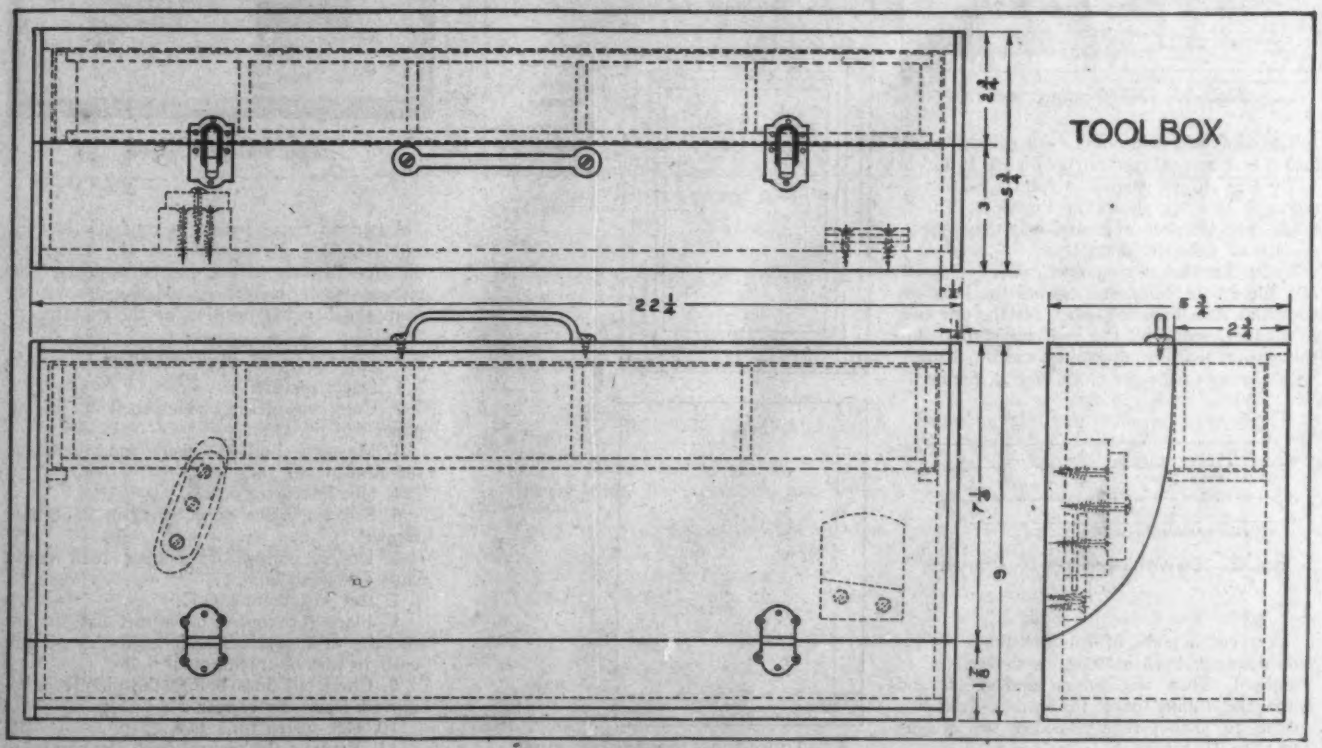
In constructing the nail tray ¼-in. stock is used:

Bottom and sides	3 pcs.	¼ x 2¼ x 21¼ in.
Ends and partition walls	6 pcs.	¼ x 2 x 2¼ in.

The working procedure is as follows:

1. Get out stock for the 2 sides and square to dimension. Rip a 1⅝-in. strip off the one side at an angle.

2. Get out stock for the 2 ends, square to dimension and rabbet all four edges ½ in. wide to a depth of ¼ in.



Boy's tool chest

3. Clamp ends together and cut out curve as shown in drawing.

4. Get out stock for top and bottom, rabbet sides ½ in. wide to a depth of ¼ in. Rip a strip 3 in. wide from the top piece.

5. Sand all pieces and assemble box with 4d finishing nails.

6. Cut out blocks to hold saw and fasten to lid with screws.

7. Construct nail tray and fasten blocks in chest to hold tray.

8. Attach hinges, handle, and snaps with wood screws.

9. Resand and finish to taste. A black enamel is very satisfactory.

REPOUSSÉ IN COPPER

A. G. BELESON

New York City, N. Y.

Work of this type requires a few tools that can be constructed with very little effort and with hardly any cost. With careful work a product worthy of commercial competition can be produced. The work with copper is interesting, creative, and develops skill. One soon develops the ability to select the proper subjects for copper repoussé work.

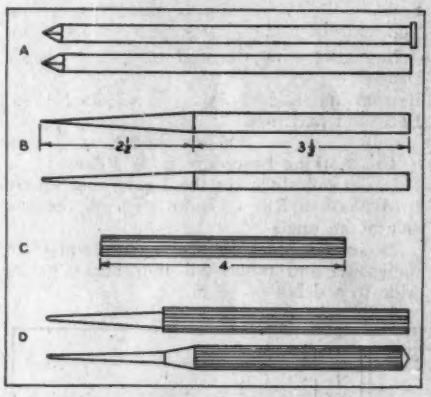


Fig. 1. The tracing tool

The tools are made of a 6-in. spike shaped into a tracing tool, as seen in Figure 1, and a ¼ by 6-in. dowel, shaped to form a raising or repoussé tool, as shown in Figure 2. For a more complete set of tools, one may select dowels of different diameters.

To make the tracing tool, select a good 60d spike 6 in. long, and cut off the head as shown at *A* in Figure 1. Then file the one end to a taper, round off the end, and smooth up the entire tool by drawfiling, and polish it with abrasive paper or cloth. See *B*, Figure 1.

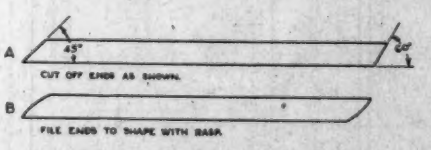


Fig. 2. Dowel used as a repoussé tool

Next cut a piece of rubber tubing, ⅛ inside diameter by 4 in. long, as shown at *C* in Figure 1. Then wet tubing and metal and force the tubing onto the spike. Trim the tubing to shape, thus finishing the tracing tool. See *D*, Figure 1.

To make the raising tool, take a ¼-in. or ⅜-in. dowel and cut off the ends as shown at *A* in Figure 2. Then shape the ends as shown at *B* and finish them with fine abrasive paper.

When working on the copper, an important requisite is a flat, smooth, soft surface which

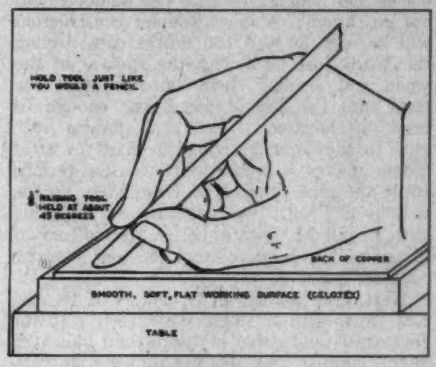


Fig. 3. Raising the picture

may be obtained by using newspapers, or material similar to celotex. With the proper surface to work on, excellent results are soon obtained.

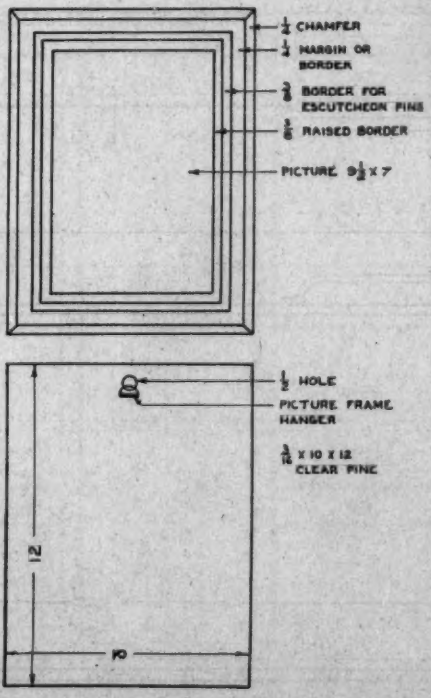
A few facts are important in order for one to produce a good job. The picture must have depth. In order to give lifelike appearance and to please the eye, the parts of the picture nearest the front must be raised more than those in the background. With a bit of practice, one soon can detect what parts require more height and what parts require more depth.

For the best and simplest work, one should select the profile picture. It is the easiest type to work on. After skill has been developed, one should attempt other type pictures.

For contrast and various degrees of shading, you will find that through the use of "liver of sulphur" a very dark shade may be obtained. The high spots are usually polished with fine steel wool and the deep lines are allowed to remain black. This tends to bring out the outline of the picture.

For mounting the picture, two forms are quite attractive. Modernistic results are obtained through the use of white picture frames. For general use, the picture is mounted upon a solid board with a slightly rounded or chamfered edge, stained to match the furniture. The copper may be held in place with brass escutcheon pins, equally spaced. This adds to the beauty of the copper picture. The best results are obtained when the picture is mounted on a board which is at least ¾ in. thick.

In order to retain the highly polished surface, a coat of clear lacquer is applied. The lacquer also is used to produce a good finish on the frame or solid mounting board. For a *furniture finish* apply several coats of lacquer, rubbing each down lightly with a very fine steel wool.



Layout of the copper sheet

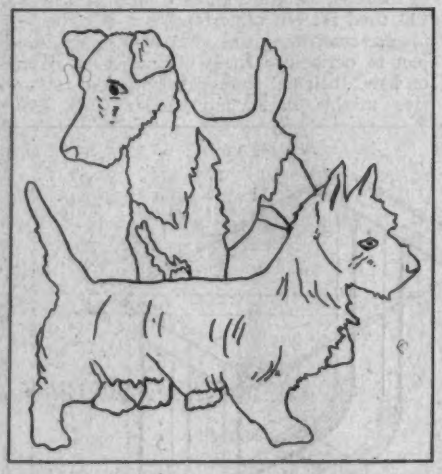
The finished piece

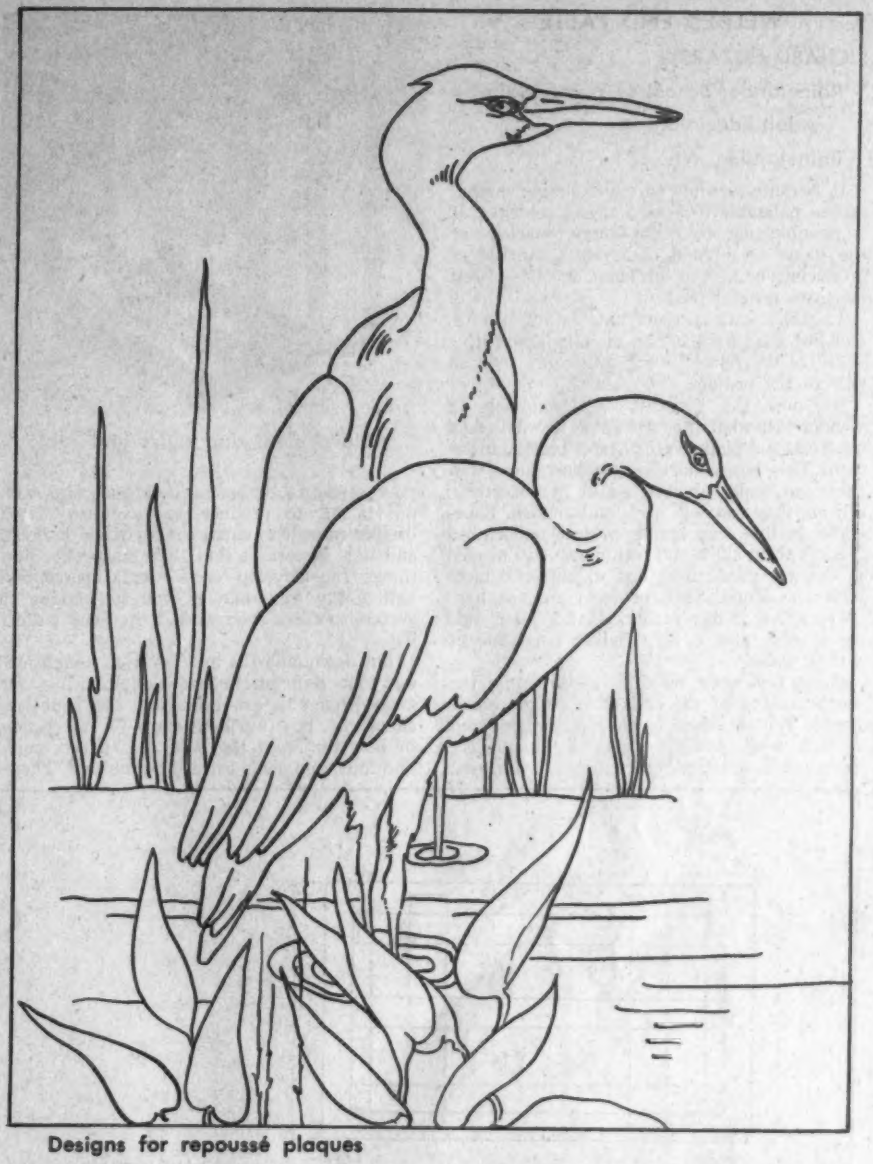
A picture frame hanger is centrally located and attached on the back of the frame so that it will hang in the desired position. The picture frame hanger should not be visible from the hanging position of the picture.

Method of Procedure

1. Select picture.
2. Copy the picture with pencil on tracing paper 8½ by 11 in.
3. Measure borders inside and outside; see drawing or sample.
4. Get instructor's O.K.
5. Select a piece of 9 by 12-in., 36-gauge copper.
6. Fasten picture on copper with paper clips or scotch tape.
7. Get instructor's O.K.
8. Place the copper on a soft flat surface such as a magazine, and trace the picture onto it with a tracing tool.
9. Check all lines before the picture is removed from the copper.
10. Get instructor's O.K.
11. Remove the picture from the copper.

Designs for repoussé work





Designs for repoussé plaques

12. Retrace the lines on the copper surface with tracing tool. This work should be done on a soft flat surface.
13. Raise the picture with the raising tool, working from the back. See Figure 3.
14. Check picture for proper depth. The parts nearest the eye must be raised more than those in the background.
15. With the copper lying on a soft flat surface trace the outline of the picture again with the tracing tool.
16. Get instructor's O.K.
17. Clean the picture thoroughly, scrubbing it with fine steel wool. Rub in one direction.
18. Apply liver of sulphur to oxidize the picture and to bring out the outline of the picture.
19. Allow to dry.
20. Remove the oxidation from undesired areas of the picture by rubbing the surface with fine steel wool.
21. Apply a coat of clear lacquer with a brush or spray gun.
22. Allow to dry.
23. Get instructor's O.K.

The Frame or Backing Board

Use a solid board stained to any desired color for the frame.

1. Select a piece of 13/16 by 10 by 12-in. clear pine or other suitable wood.
2. Square up the stock and get instructor's O.K.
3. Plane ¼ in. chamfer on all front edges.
4. Sandpaper all surfaces and get instructor's O.K.
5. Locate picture on the board.
6. Locate where the escutcheon pins are to be placed.
7. Mark the position of corners on the wood.
8. Remove picture from board.
9. Give the board a coat of the desired stain.
10. Wipe stain dry and clean off the surface with a dry cloth.
11. Allow stain to dry.
12. Place copper picture in position. Get instructor's O.K.
13. Fasten corners of picture to the board with escutcheon pins.
14. Mark position of escutcheon pins with an awl.
15. Fasten picture permanently in place with the escutcheon pins.
16. Locate position of picture hanger on back of board.
17. Fasten picture hanger in place. Get instructor's O.K.
18. Apply a coat of clear lacquer to the entire picture with brush or spray gun.

Related Information

1. Gauges of copper
2. Manufacture of copper
3. Forms in which copper may be obtained
4. Physical properties of copper
5. Oxidation of copper with liver of sulphur
6. How to polish copper
7. Escutcheon pins, sizes and uses
8. Steel wool, grades and uses
9. Abrasives, grades, uses; how abrasive paper is made
10. Stain, kinds, uses, manufacture
11. Lacquer, kinds and uses
12. Coloring of copper, antique finish, natural green

WELDED END TABLE

RICHARD HUZARSKI

Rhinelander School of Vocational and Adult Education

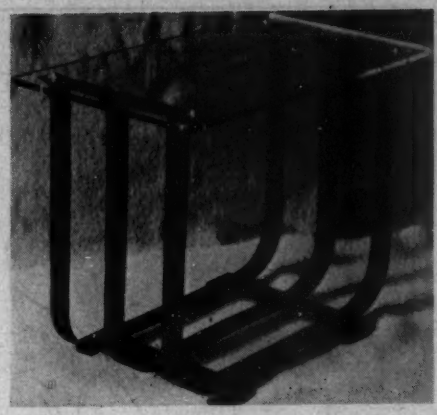
Rhinelander, Wis.

It is quite possible to make simple mathematics palatable to your welding students. It is possible also to make them conscious of the value of a good design and capable of producing one. The problem resolves itself into two general phases:

1. Make each project interesting, useful, and just a bit harder than the one before it.
2. Tie the related work intimately to each step of the project.

By now the students are beginning to wonder just what they are going to weld when the rush for planes, tanks, and battleships is over. This is a good time to show them that they can make objects useful in peacetime, objects they can sell, own, and cherish. Especially is this true if the project undertaken teaches them skills and techniques still needed in the war production, and so kills two birds with one stone. Such projects are not hard to conceive if one realizes that a fillet weld on an end table is no different from one on a tank plate.

Start the work by drawing a simple isometric sketch of the end table on the blackboard. Tell the class to copy it step by step, as you work slowly, talking of the project, using such drafting procedure as you wish



Welded steel and glass end table

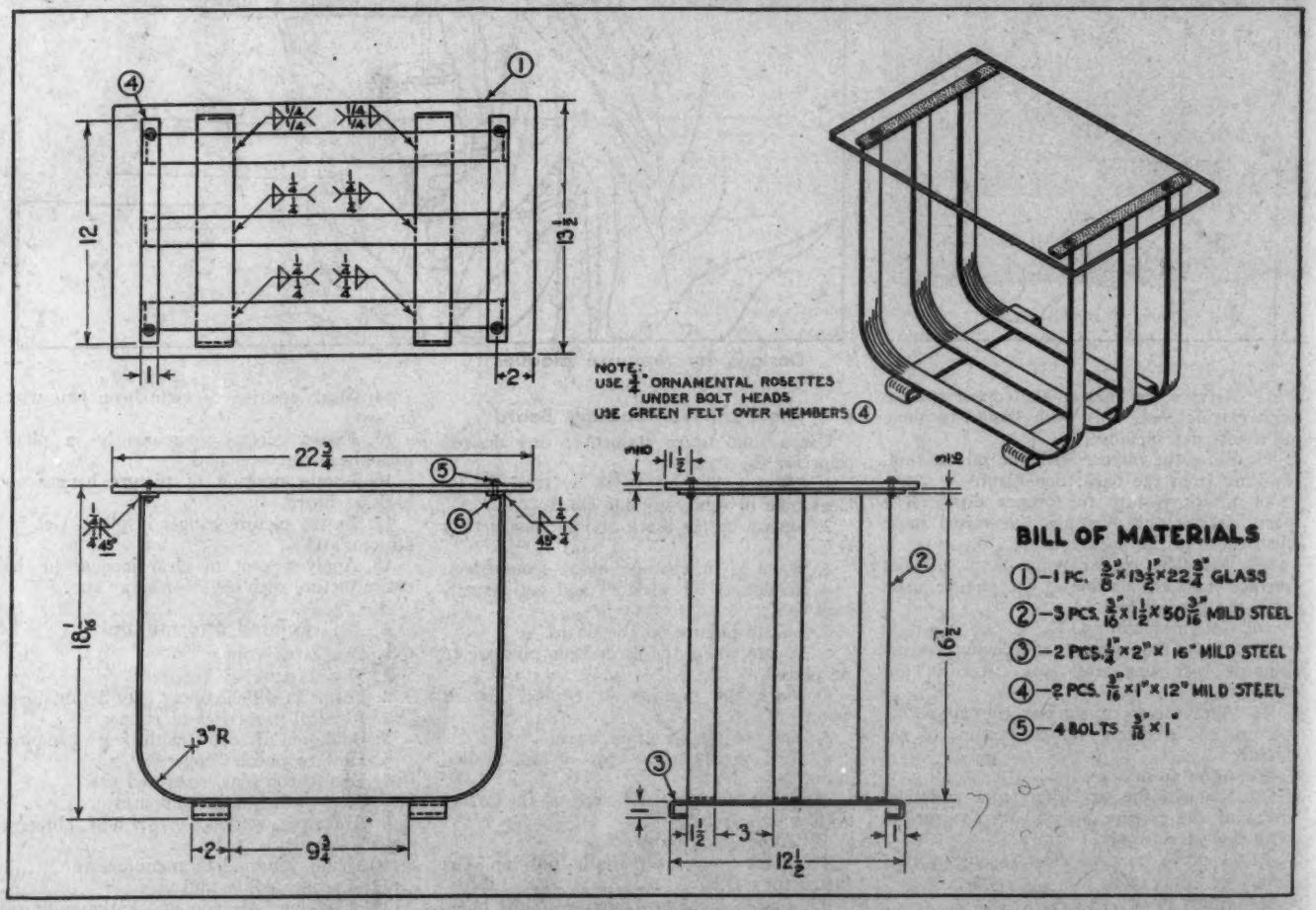
your students to learn. It takes only care, not talent, to produce an isometric sketch lifelike enough to catch the students' interest, and it is important that they make one. Few things can develop one's spatial perception and ability to design as well as learning to sketch, so check their work, help them, correct it.

Put down only the basic over-all dimensions on your own blackboard sketch. When the class begins to ask how long the bent legs should be, how much to allow for the bends, or how far apart the bolts are spaced, guide and hint, but don't solve the problems. Therein lies the first part of your students' mathematics lesson. The second part will come when the matter of cost is approached. Inches and fractions of inches will have to be changed to volumes, these will lead to the specific weight of stock, to the pounds of material used, and finally to the actual dollars and cents involved. Not a small problem in estimating, and not a bad lesson learned.

Coming back to the sketch, one thing it is sure to prove is its own inadequacy. No matter how it was drawn, it will not show all the sizes and welds. So here is the time to prove to all the doubting and reluctant the value of a mechanical drawing with all the dimensions and welds clearly displayed.

Let the students make their mechanical drawings. Some day they will have to read many of them, and read them correctly if they wish to progress. When questions are asked make your explanations by pointing to the sketch. The *fillet* symbol, the *bevel* symbol, the *flush* line, and the *enclosed angle* lose all of their mystery when simply displayed. Requirements of strength and appearance will dictate their use.

While on the subject of appearance remember that steel alone looks monotonous and gloomy. This flaw can be easily relieved by blending it with lighter materials. Glass plate $\frac{3}{8}$ in. thick, obtained gratis from a local bank, was used for our table top. As a rule, banks, finance companies, and other institutions, subject to periodic changes of furnishings, have on hand their old plate-glass partitions, imitation marble slabs, and similar stock. Ap-


NOTE:
USE $\frac{1}{4}$" ORNAMENTAL ROSETTES UNDER BOLT HEADS
USE GREEN FELT OVER MEMBERS ④
BILL OF MATERIALS
①–1 PC. $\frac{3}{8}$" × 13$\frac{1}{2}$" × 22$\frac{3}{4}$" GLASS
②–3 PCS. $\frac{3}{16}$" × 1$\frac{1}{2}$" × 50$\frac{3}{16}$" MILD STEEL
③–2 PCS. $\frac{1}{4}$" × 2" × 16" MILD STEEL
④–2 PCS. $\frac{3}{16}$" × 1" × 12" MILD STEEL
⑤–4 BOLTS $\frac{3}{16}$" × 1"
3"R

Welded end table

proached tactfully, they may prove to be a veritable treasure trove.

With their drawings completed, the students are ready for the shop. They will have a lesson in skill and caution while making a 7/32-in. hole in glass, using a triangular file lubricated with turpentine. It will tax their accuracy to space the holes in the steel below so that the 3/16 by 1-in. white metal bolts will go through the glass plate and the supporting braces below it. The use of felt strips along the planes of contact, and attractive rosette washers under the boltheads will show them how to relieve strains. All in all, they will learn a great deal before they apply the Hossfeld bending machine to the leg stock, 90 amperes of current to their ⅛-in. mild steel electrodes, and flat black paint or burnt oil as protection for the metal. What is more important, they will enjoy learning it.

The end? Not quite. Place the finished table where people can see it. It will be well to have the girls of the commercial department praise its beauty, and the home-economics teacher ask for one for her displays. This type of admiration will make your student do even better on his next projects. If it doesn't he will never be much of a welder — or a man.

HOW TO MAKE A PHOTO-LETTERING SET

LT. R. RANDOLPH KARCH, USNR

Where type and presses are available to the operator of a duplicating offset press, there is no great problem in getting fairly good reproduction proofs for printing a variety of work. But, when one does not have access to type and presses, he must rely on the ability of artists or letterers on the staff to draw up the general run of work. Likewise, where the duplicator operator manufactures books by the use of typewriter copy, he has little or no choice in type faces for chapter headings — he must perforce use the capitals of his typewriter for display. To do the best work, he should have means for contrasting type faces to get the needed attention to his work.

An attempt is made in this article to explain

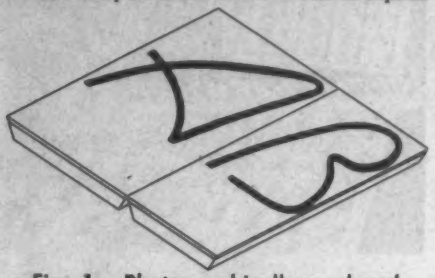
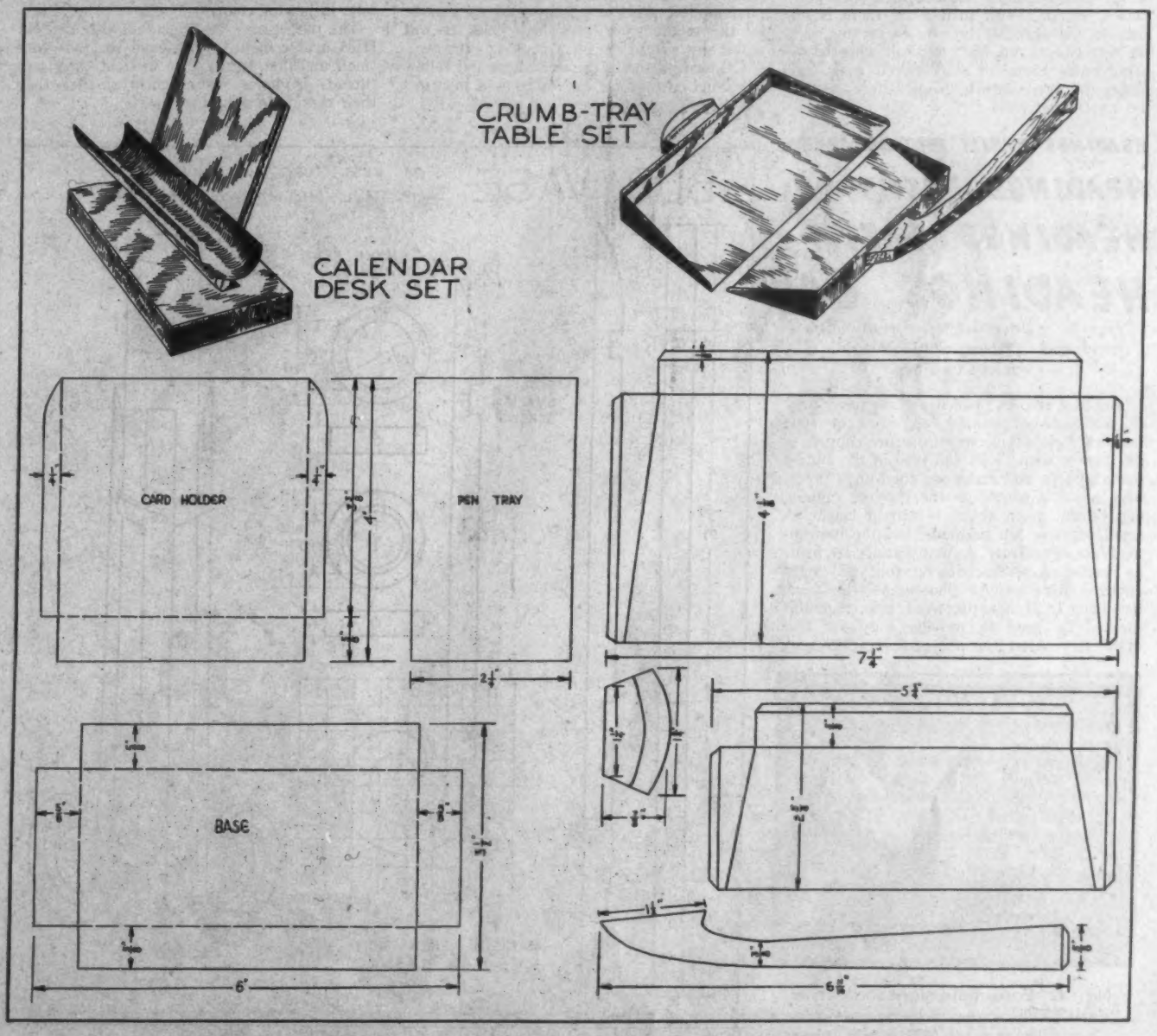


Fig. 1. Photographically-produced letters showing detail of construction. Back trimmed bevel shown exaggerated



Calendar and crumb-tray set designed by Kenneth R. Kuemmerlein, Appleton, Wis.

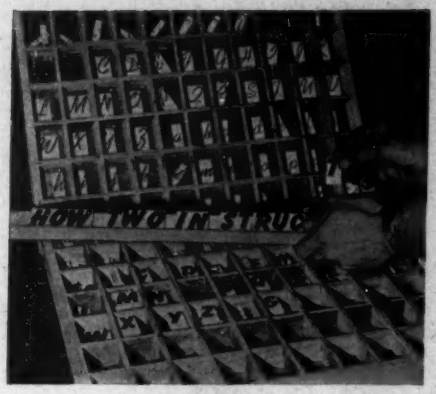


Fig. 2. Using the composing stick. Two cases of type are shown

how a photolettering set can be made entirely in the school shops, without any part purchased outside. With such a set there is no limit to his available type faces in any size. He merely sets up his lines following copy, photographs them to the desired size, and pastes the prints into his copy before making the final negative.

Fig. 3. Unretouched reductions produced photographically in a variety of sizes

The first step is to secure a complete copy of the alphabet wanted, or series of type families needed. One way to secure copy is to get a print shop to set the type in the largest size available, and make one good press proof. This proof is placed on the copying camera, and blown up to about 1 inch in height. A small negative can be made, and the blowups made on an enlarger. As many prints are made as needed. A seven-character font will make enough characters to photograph the usual headline. It is not suggested here that this method be used to provide copy for text material. After the photographic prints are made and developed, they are pasted to ⅛-inch mounting or illustration board, as shown in Figure 1. To secure correct alignment of letters, the prints should be mounted on the board first, then cut in a printer's paper cutter. Cut the length of the lines first, then cut each letter out, back trimming each. Sufficient space must be left between letters when the proofs are made to allow for back trimming. Figure 1 shows the back trimming, which automatically provides a slight bevel. This bevel insures a tight fit of type, so that the camera cannot see and record any shadows between characters.

A *composing stick* is made of wood, unpainted or painted white. It is U shaped from an end view, with one ascender of the U much taller than the other. The types fit into the stick as shown in Figure 2. No spaces are necessary, as each character is held securely in the stick. The stick in the illustration is 36 in. long and 2 in. high. The clearance for the types was ⅛ in.

Figure 3 shows an actual and retouched photographic print of a variety of sizes made by the method just explained. One set will make any sized type on a copying camera.

Cases are made in the woodshop, and follow the usual pattern for cap cases used in printing. See Figure 4.

Fig. 4. Cases hold eight characters each. The cases are home-made since the regular California type cases are too small

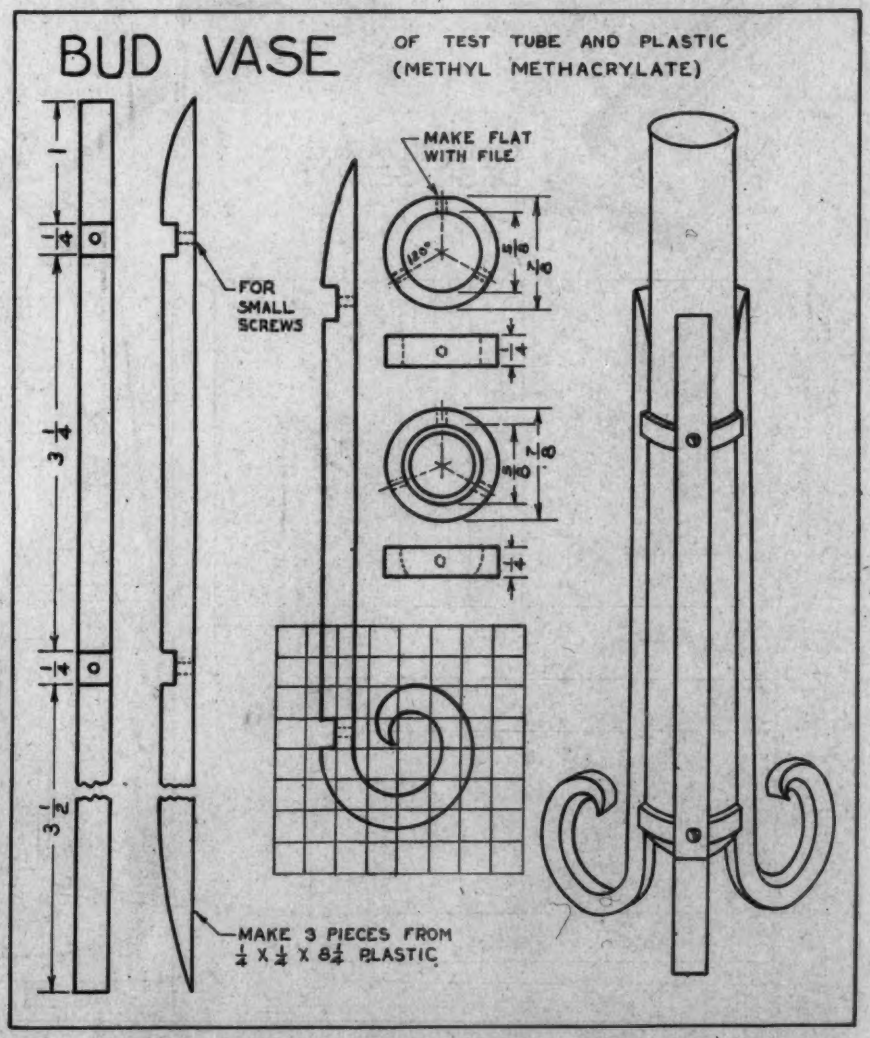
A PLEXIGLAS BUD VASE

CPL. E. E. SMITH
March Field, A.A.B.
Riverside, Calif.

The bud vase shown here was made from a test tube and some discarded pieces of plexiglas. The test tube used happened to be about 6 in. long and ⅝ in. in diameter. Any variation from these dimensions would, therefore, necessitate a slight change in the plans to accommodate the diameter and make for the best proportions. The design also may be adapted to the eliptical glass tubes obtained with some kinds of toothbrushes.

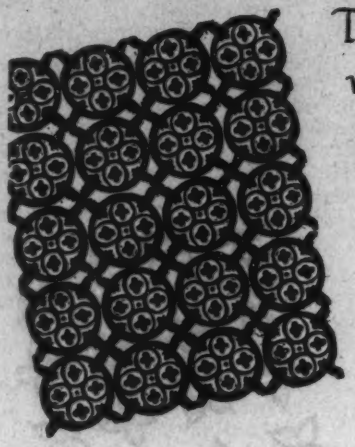
Plexiglas (methyl-methacrylate) may be bent by heating in hot water or with a flame. It is made in all colors. In the clear color it will polish clearer than glass with the use of crocus cloth and rouge, or any fine buffing preparation. Sanding with fine sandpaper will give it an opaque or ground glass appearance that is a good contrast with the glass test tube in lieu of color.

The pieces may be cemented with DuPont H-87 acid cement, or fastened together with small machine screws that will cut their own threads in holes just slightly smaller than their maximum diameter.


BUD VASE
OF TEST TUBE AND PLASTIC
(METHYL METHACRYLATE)
MAKE FLAT WITH FILE
FOR SMALL SCREWS
MAKE 3 PIECES FROM ¼ X ¼ X 8¼ PLASTIC

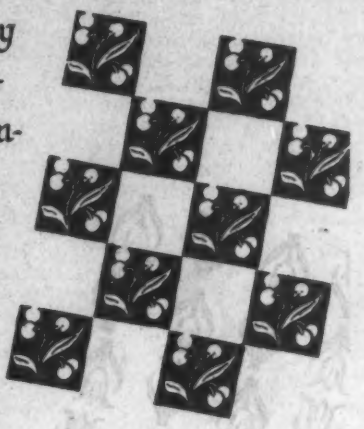
Plexiglas bud vase

HOW IS THE BLOCK-PRINTED TEXTILE DESIGNED?

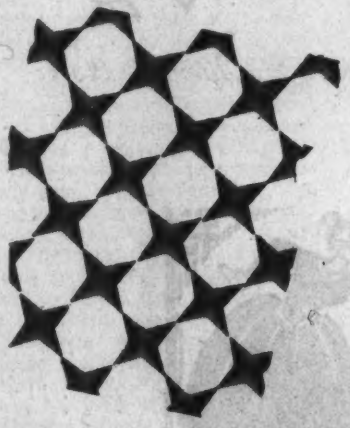


Single Block Repeated Each Square

Textile prints include every variety of subject, expressed in geometric, conventional, or naturalistic form. One, two, or more blocks (repeats) may be used in the design. The repeat arrangement is somewhat determined by the pattern, but usually is based upon a square or diagonal plan.

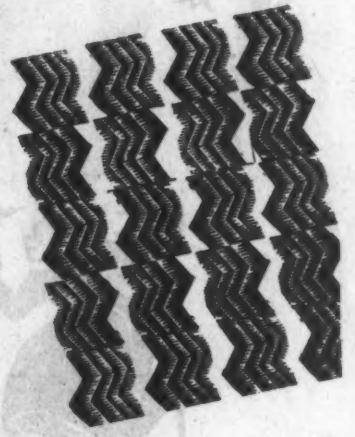


Single Block Alternate Squares

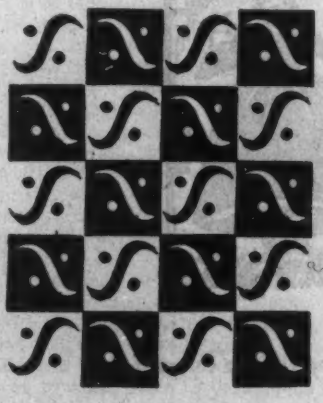


Diagonal Arrangement

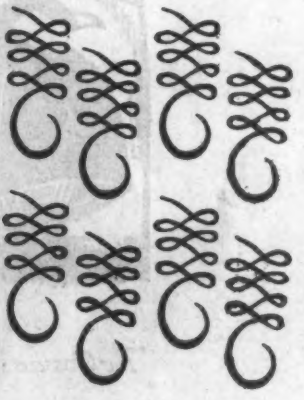
Random Placing



Columnar Arrangement



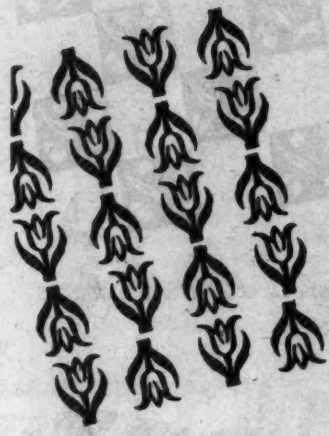
One Block Reversing Background (Counterchange)



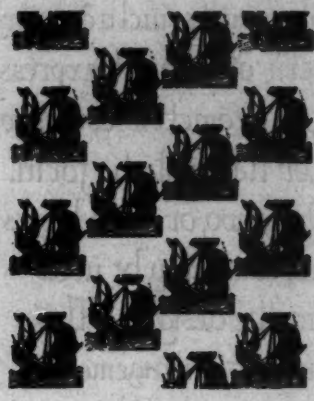
One Block Reversing Color in Alternate Blocks

Plate 44. Design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

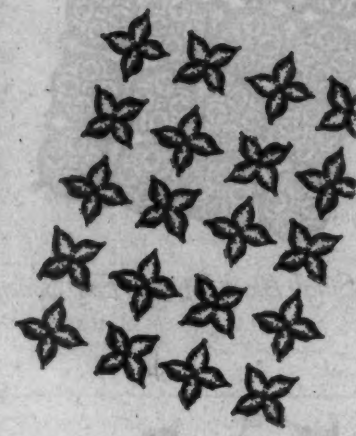
BLOCK-PRINTED TEXTILES (Continued)



Rotated 180° in Alternate Blocks



Block Dropped Half Its Height



Rotated 45° in Alternate Blocks

A Sequence of Several Blocks
"The Gossips," Courtesy Virginia Lee Demetrios, The Folly Cove Designers

Plate 45. Continuation of design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

FOUNDRY PRACTICE IN THE GENERAL SHOP

G. HAROLD BILLINGHAM

High School

Weehawken, N. J.

Foundry practice can be readily added to make another important activity in the general shop with very little expense involved. It is one of the easiest to install.

The location can be a corner, or a wall space, in a section where sawdust from the woodworking machines would not be likely to fall into the sandbins.

A worktable 12 ft. by 28 in. by 32 in., with toe space, and two 40 by 20 by 20-in. hoppers for sand, make a good layout. Covering the sides and bottom of the sandbins with sheet metal is the most serviceable way to finish off their insides. The front side should be slanted in at the bottom to avoid a sharp corner, and make shoveling easier. Covers that lift off should be provided to keep foreign matter out of the sand when the bench is not in use.

A backboard 40 in. high will be ample for all necessary equipment. This should be divided into two parts for dispensing and checking tools. Silhouetting all tools on the board helps to make the checking of returned tools an easy matter.

Four students working in pairs do the best job due to the competition involved. They are numbered from 1 to 4. One week is devoted to practical work, then follows the actual pouring in the second week, after which boy No. 4 goes to another activity. The others then move up, and a replacement fills in at number one. The newcomer thus joins students with varying degrees of experience.

Patterns should be assorted, the ones for beginners having excessive draft. A set of book ends is easily made, and can be a stimulus for the final job. It may be good policy to ask students to furnish their own metal if they are to take home the product. Type metal or lead are very satisfactory to use.

Some soldering iron furnaces have a cover with provision for heating a pot. This sort of equipment can be used very satisfactorily for melting the metal, but takes longer than one of the commercial furnaces specially made for the purpose. A hood can also be installed to take off the fumes.

As a safety precaution, holes should be drilled near the top of the pot so that a rod can be shoved through to aid in the lifting and pouring processes. A frame similar to that used in industry can be made to hold the pot. Two pair of asbestos gauntlets should be provided for use during the pouring process. Duplicate equipment at the furnace is not desirable from a safety angle.

The writer's article on pages 45 to 47 of the February, 1944, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, entitled, "Gearing the General Shop to War Needs," lists supplies and equipment needed, as well as steps to follow.

Technical developments in foundry practice have been drastic in the past few years. "Gating," which has to do with the manner in which liquid metals are introduced into the mold, and "Risering," the technique by which a steady stream of metal is fed to the cooling mold, are examples.

Films are obtainable which will create additional interest in this industry, which has expanded so much in our war effort.

WHITTLING-JACKKNIFE TECHNIQUE

W. BEN HUNT

Hales Corners, Wis.

(*Continued from page 330 of the October, 1944, issue*)

Neckerchief Slides

Crow's skull: It is not hard to make a neckerchief slide from a crow's skull, providing you have a crow. Everything being considered, it is a lot easier to make one from a piece of white pine or basswood. In the one shown in Figures 156 and 157 it is not even necessary to saw out a silhouette as has been done for most of the whittling jobs previously described in this series. To start, whittle out the general shape which can be taken from the top and side views in Figure 156. As you will notice, in Figure 157, the ends of the neckerchief cross in the skull opening and go out through the eye sockets. This means you will have to dig out three holes. Start with the one at the rear end of the head; the dotted lines in the side view show the shape. When down almost as far as the drawing shows, start digging out the eye sockets in the general direction shown by the dotted

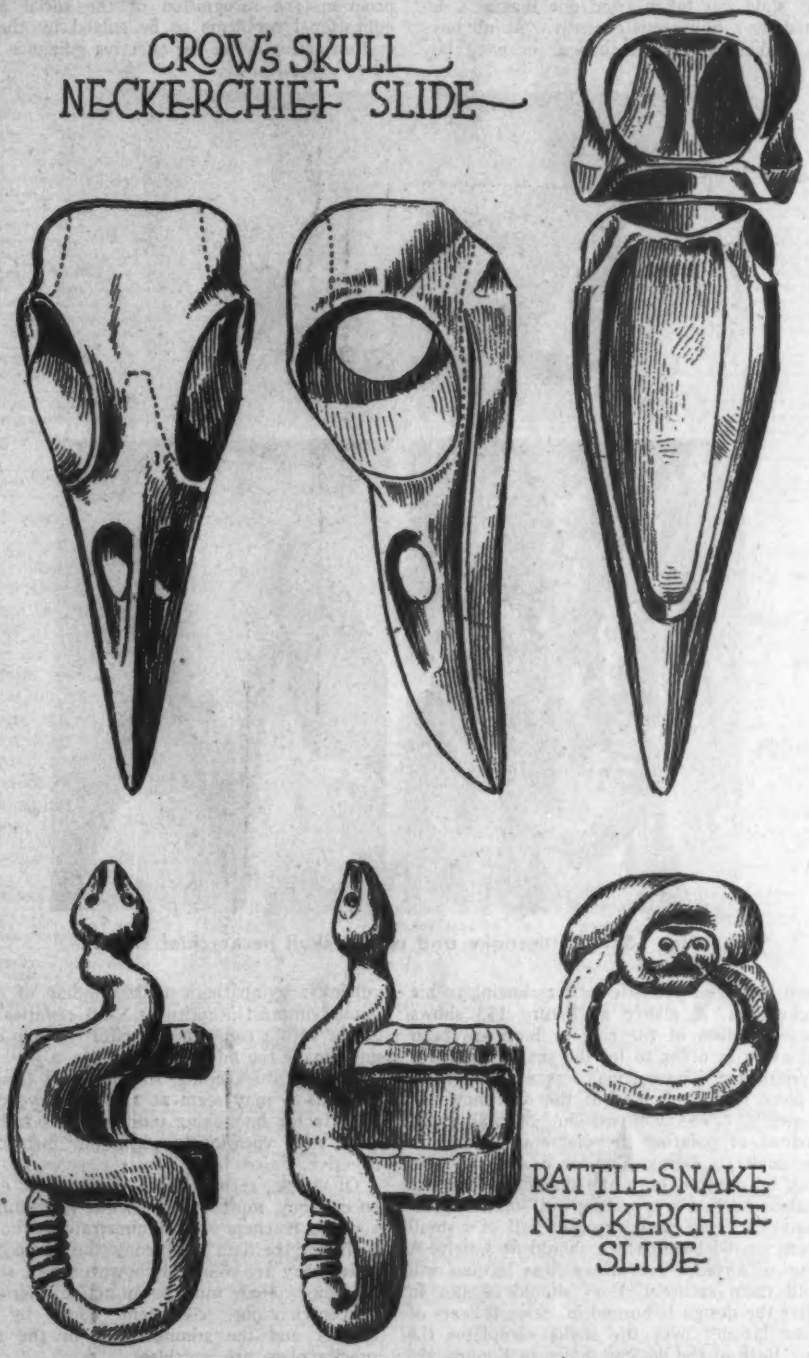


Fig. 156. Full-size pattern of crow's skull neckerchief slide
Below — Fig. 158. Full-size pattern of rattlesnake neckerchief slide

lines in the top view. When all three openings meet, cut out as shown. The nostrils are made by making an oval hole straight through the beak with slightly depressed areas on either side as illustrated. Cut out the bottom to lessen the weight. When you have finished whittling, sand the entire skull nice and smooth. To paint this neckerchief slide, use Chinese white water color for the skull and a solid black for the beak. To make the skull more realistic, paint the inside of all the openings a light gray. When the colors have dried, give the entire piece a couple of coats of clear lacquer (clear fingernail polish).

Rattlesnake: This rather unusual neckerchief slide was taken from one that was designed by a boy scout executive. As all boys like snakes, here is a chance for each boy scout to have a realistic rattler clinging to his neckerchief. A glance at Figure 158 shows that a section of the ring or loop has been cut away in order to let the snake stand out prominently. The original was whittled from a piece of white pine but the one shown in Figure 157 was whittled out of mahogany. Instead of painting the diamond designs on the snake, a burning set or a red hot wire may be used to burn the diamonds into the snake's back. For eyes dig out small depressions just large enough to take half of a small green or red bead, which should fit snugly. A drop of airplane cement or clear lacquer will hold them securely. Eyes should be put in after the design is burned in. Several coats of clear lacquer over the snake completes the job. Both of the designs shown in Figures 156 and 158 are full size so that they may be used directly as patterns.

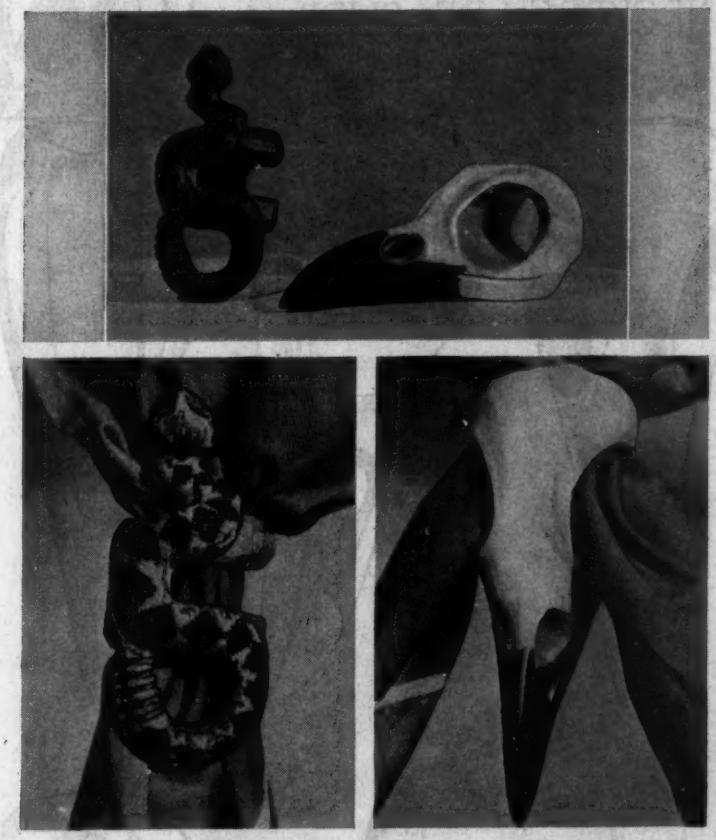


Fig. 157. Rattlesnake and crow's skull neckerchief slides

THE PERFORMANCE ANALYSIS CHART

HENRY L. ROSSÉ

Co-ordinator, Vocational Industrial Education

High School

Eddystone, Pa.

The type and number of records kept by teachers and directors of vocational industrial education and industrial-arts education depends largely upon the size of the educational program, the recognition of the social and educational problems to be solved by them, and an active desire for effective guidance involving a sympathetic understanding of each pupils' interests, aptitudes, and abilities together with a conscientious effort to help each pupil make the most of these.

This record keeping, tiresome and troublesome as it may seem at first, is however, a vital factor in making industrial-arts instruction and vocational education instruction effective.

Of course, records must justify their existence. They must satisfy some real purpose and the teachers and administrators who are gathering the data must know the purpose for which they are collected; however, as I stated previously, there must be an active desire and a conscientious, consistent effort by the teacher and the administrator or the most precise plans are worthless.

Most of us realize that a new method of instruction is retarded and often finally rejected not due to its undesirability, but rather because of a lack of a uniform system of grading, recording, and charting, which is designed to perpetuate its activity.

The old technique of subject teaching where the teacher disregarded the past experience and interests of the pupil is fast fading from classroom and shop. However, there are still teachers in this modern age who are amazed and perplexed by the myriad conclusions to the same simple problem. Stupidity and misfitted or uninterested seems to be the quick and effortless decision of the instructor, although the fault usually originates with the teacher's lack of definite conditioning for that particular response.

Individual instruction and individual guidance have been advocated as a cure for such ills of instructional technique; however, if the teacher does not understand how and under what conditions we learn, how and what we remember, and at what rate we forget what is presented, there can be no sympathetic relationship, no efficient establishment of desirable habits, and surely the training must be far from effective.

We do have many successful group progress charts in operation and there have been many attempts to devise an operation sheet to increase the effectiveness of our instruction, but although we admit that teaching operations and processes is the most effective technique of instruction, we grade and chart our results on a job basis after the project has been finished which possibly is due to the lack of a unique system to accomplish our aim.

I have studied this problem and devised a system which is successfully attaining these results, when as I said before, it receives consistent, conscientious effort on the part of the teachers, and in such cases through its orderly procedure there has developed efficient and effective training.

The system requires organization, but once established it is a boon to teacher and pupil.

It has been reiterated that, "If only I had known what John was thinking, I could have prevented his accident." Try this system and you will check many of his errors before they become costly mistakes, and your training program will be more efficient and more effective.

Assuming your shop is well organized with your jobs analyzed and prepared in the order of their difficulty for operational training purposes, the pupil having finished his first job returns to the shop clerk for job No. 2. With the new working drawing he receives his performance analysis chart. He signs his name, and records his grade and section, the name of the project, the date started, and the rate set for the completion of that job. The pupil then studies his working drawing and analyzes the operations to be performed, recording them in the proper sequence of performance, and indicates by the means of a check mark those operations he knows he can perform leaving blank all those that are questionable.

He indicates the machines he will use in performing his operations, which is then approved by the safety inspector. If he hasn't passed his test for the operation of the machines indicated, he must do so before he has the approval for the operation of that particular machine. If he violates this rule he will be penalized by the safety council by having his machine operator's card revoked for one week.

Then on the reverse side he records the quantity, kinds of material to be used, rough

Performance Analysis Chart

Report Period _____ Shop _____

Date started _____ Finished _____ Pupil _____ Sec. _____
Hours on job _____ Rate _____ Project _____
Deficit _____ Bonus _____
Production Rate Fast ☐ Moderate ☐ Slow ☐

Cause of Slow Production _____

Machines to be used _____

Approved-Safety Inspector

Tools to be used _____

I can perform these operations

Operations to be graded as performed. Space for teachers grade of Operation and Theory.

No.	Operation to be performed	Pupil Check	Unsatisfactory	Satisfactory T.	Satisfactory P.	Good T.	Good P.	Excellent T.	Excellent P.

Total marks in each column

Method of arriving at grade for operations performed in this unit.	U	S	G	E

Final grade for operations performed in this unit.

Your analysis is correct. You may now start work on the above operations in the order specified.

T - Theory
P - Practice

Signature of Instructor

Materials Used on Job

Quantity	Kind of Material	Size	Description	Cost

Hardware	Cost		Cost

I should like to have more instruction concerning:

Where can I find the answers?

Shop Conduct Rating

Desirable Industrial Habits	U	S	E
Reliability			
Safety			
Interest			
Initiative			
Courtesy			
Conservation			
Cooperation			
Total - No. Marks			

Grade _____

Remarks

Results of conference: Date

This sheet must be returned to office when completed.

Pupil Signature _____

Teacher's Signature _____

Front and reverse of performance analysis chart

size, description of part to be made, the cost, and the tools to be used on the job.

The pupil then calls upon the shop clerk or foreman, who has charge of the shop library, in addition to his other duties, to help check his chart. They analyze the questionable operations using the shop operations manual and shop theory texts as reference. If the solution is found he then checks the remaining blanks; if not, the blanks indicate further clarification by the instructor.

The pupil has now analyzed the problem as he visualized it, and presents the chart along with his blueprints to the instructor for his examination and approval. If his analysis was found to be correct the instructor indicates his approval by signing the chart. If the contrary was found, the instructor withholds his signature until satisfactory adjustments are made.

Up to this point, the pupil has performed all of the clerical work and through his written analysis there is no doubt or misunderstanding between him and the instructor as may happen through oral direction.

As the instructor examines the pupil's analysis there is revealed a definite picture of the pupil's anticipated performance. The instructor now knows what the pupil contemplates doing and may correct any fault or unorganized thinking, thus preventing the formation of an undesirable habit.

As the instructor checks the performance of each pupil, the assistant foreman records the results on his chart. If an operation is performed unsatisfactorily, he is given another demonstration by the instructor and he continues his practice of having his technique checked as often as possible until his performance has been checked as satisfactory. A check mark must be indicated for each unsuccessful performance.

When the job has been completed the total number of marks in each column is recorded by the assistant foreman and placed over in the graph for evaluation of the unit. The final grade is determined readily by the distribution of these numbers, and it may be shaded slightly by glancing at the production rate.

Here it may be well to say, that setting a rate on any job creates a time consciousness and encourages the pupil in motion study to eliminate his undesirable techniques and rewards him with a bonus for his accuracy and speed.

Rates are easily set. Moderate production is an average rate of previous performances, slow production is below average, and fast production is above.

The cause of slow production indicated on this chart gives the pupil an opportunity to correct his faults through the encouragement of the instructor.

There is a space on the reverse side of the chart where the pupil may jot down questions which do not require the immediate solution

GRAPHIC RATING SCALE

Desirable Industrial Habits	U	S	E
Reliability - How well he can carry out orders	Unreliable	Usually reliable	Reliable
Accuracy - How precise his work is done	Rejected	Few errors	Outstanding in every detail; no errors
Safety - Use of safety devices; carefulness	Timid	Cautious	Always alert
Interest - Active; attentive to his work	Lacks interest	Attentive Doesn't watch clock	Absorbed in work
Judgment - Deciding quickly and accurately	Seldom	Momentarily	Quick to act
Initiative - Independent action on problems	Depends upon others	Carries out suggestions; solves problems	Self-reliant Resourceful
Courtesy - Showing respect for others	Disgruntled Hostile	Respect for fellow workers; for authority	Pleasingly courteous
Speed - Rate of producing	Slow	Moderate	Fast
Conservative - How well he estimates value of material	Wastes materials Wastes time	Plans work; cares for tools and equipment	Exceptionally well planned work and an outstanding evaluation of materials
Cooperation - How well he works with others	Disturbs others Will not help others Selfish	Will help fellow workers Shares tools and apparatus willingly	Volunteers personal help

Note: U - Unsatisfactory
S - Satisfactory
E - Excellent

Graphic rating scale

for the successful performance of his operation. There is also a space indicated for the answer, and sources are indicated where information may be found.

The shop conduct rating which to my mind is grossly neglected in most of our programs is an evaluation of the development of the pupil's character while enrolled in the shop. It offers a means of checking the positive or negative growth of the individual, which is necessary in any type of research, and it indicates what further efforts must be taken to help the student.

The basis for the establishment of such a chart is stated eloquently in the book, *Character*, 1872, written by Samuel Smiles. Part of his quotation is as follows: "The best support of character will always be found in habit, which according as the will is directed rightly or wrongly, as the case may be, will prove either a benignant ruler or a cruel despot. We may be its willing subject on the one hand, or its servile slave on the other. It may help us on the road to good, or it may hurry us to the road to ruin.

"Habit is formed by careful training. And it is astonishing how much can be accomplished by systematic discipline and drill.

"Nor is moral discipline and drill less influential in the formation of character. Without it there will be no proper system and order in the regulation of life. Upon it depends the cultivation of the sense of self-respect, the education of the habit of obedience and the development of the idea of duty."

Since habit is formed by careful training, a survey should be made of the pupil's accomplishment at the completion of each project to detect his positive or negative growth under the influence and direction of the teacher. That is, it should reveal the cause of his success or failure. And it is also possible during this process for a keen teacher to detect flaws in his own technique of teaching which might have been responsible for the pupil's failure.

Many of these problems must be settled out of the classroom, and time should be allotted for a pupil-teacher conference, so that adjustments can be made peculiar to each diagnosis.

The results of the conference should be recorded for future reference. You can readily visualize the effectiveness of such a procedure.

BLUEPRINT MACHINE

ROY E. HEWEY

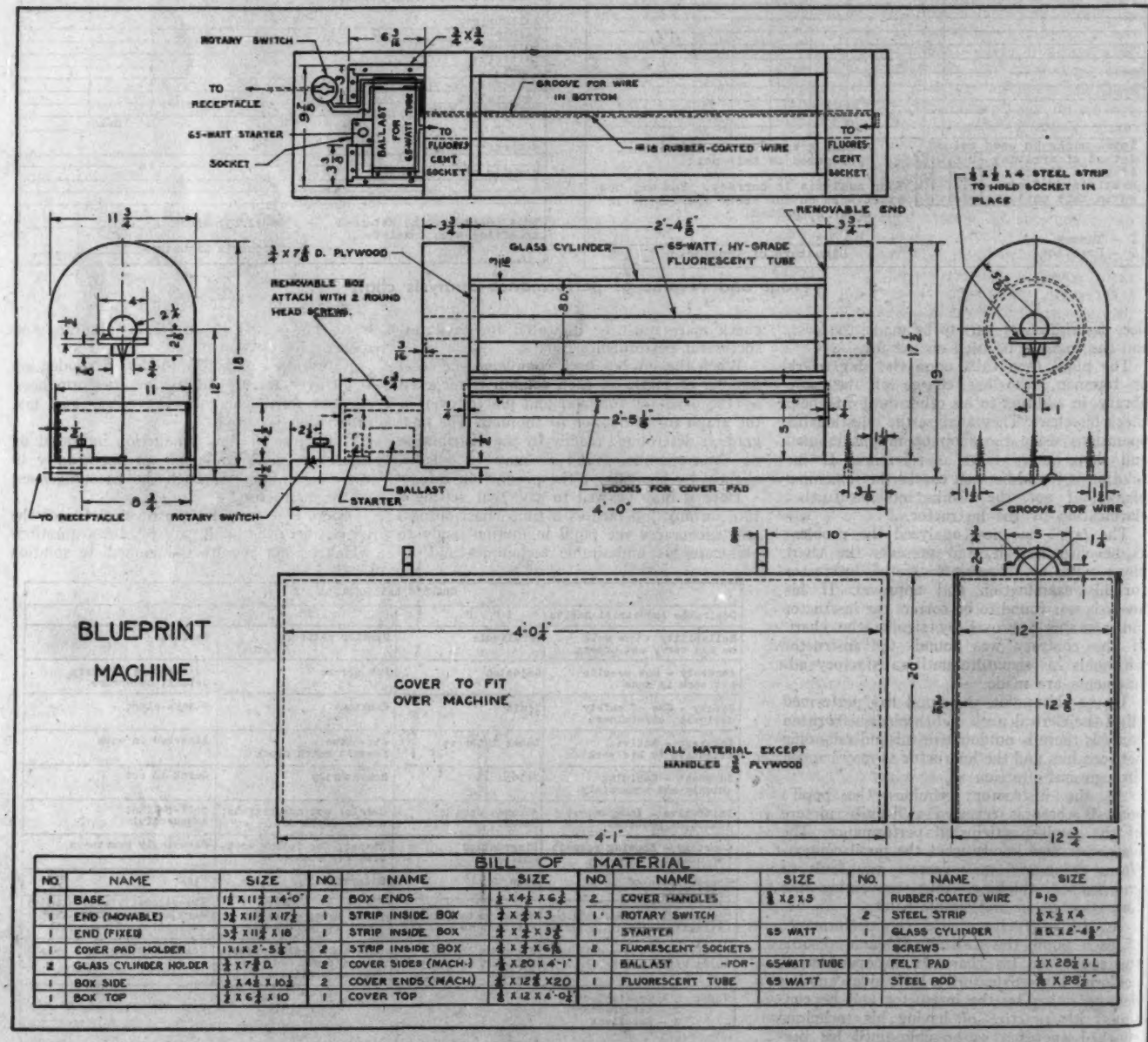
Formerly Director of Vocational Education Dept.

Senior High School

Greenville, S. C.

Now with the armed forces

The exposure machine for making blueprints, described in this article, was designed and constructed by the vocational drafting



BILL OF MATERIAL

NO.	NAME	SIZE	NO.	NAME	SIZE	NO.	NAME	SIZE	NO.	NAME	SIZE
1	BASE	1/2 X 11 1/2 X 4'-0"	2	BOX ENDS	1/2 X 4 1/2 X 6 3/4	2	COVER HANDLES	3/8 X 2 X 5		RUBBER-COATED WIRE	#18
1	END (MOVABLE)	3 1/4 X 11 1/2 X 17 1/2	1	STRIP INSIDE BOX	1/2 X 2 1/2 X 3	1	ROTARY SWITCH		2	STEEL STRIP	1/8 X 1/2 X 4
1	END (FIXED)	3 1/4 X 11 1/2 X 18	1	STRIP INSIDE BOX	1/2 X 2 1/2 X 3 1/4	1	STARTER	65 WATT	1	GLASS CYLINDER	#15 X 2'-4 5/8"
1	COVER PAD HOLDER	11 X 1 X 2'-5 1/8"	2	STRIP INSIDE BOX	1/2 X 1/2 X 6 5/8	2	FLUORESCENT SOCKETS			SCREWS	
2	GLASS CYLINDER HOLDER	1/2 X 7 3/8 D.	2	COVER SIDES (MACH.)	1/8 X 20 X 4'-1"	1	BALLAST -FOR-	65-WATT TUBE	1	FELT PAD	1/4 X 28 1/2 X L
1	BOX SIDE	1/2 X 4 1/2 X 10 1/2	2	COVER ENDS (MACH.)	1/8 X 12 3/8 X 20	1	FLUORESCENT TUBE	65 WATT	1	STEEL ROD	3/16 X 28 1/2"
1	BOX TOP	1/2 X 6 1/2 X 10	1	COVER TOP	1/8 X 12 X 4'-0 1/4"						

Blueprint machine

and electrical classes of the Greenville Senior High School. Since completion it has been used by the drafting classes with the best results. It takes approximately eight minutes to expose a pencil tracing, when using speed "00" blueprint paper. Operation of this machine is the same as the usual procedure for exposing blueprint paper. The tracing is placed face down on the glass cylinder. Then the blueprint paper is placed over the tracing. The felt pressure pad is then drawn over the cylinder, and fastened by placing the steel rod behind the hooks on the pad strip. After the exposure the pad is lifted, and for convenience a hook may be placed in the wall directly behind the machine to hang the rod on. This keeps the pad out of the way when removing paper and tracing, and when loading the machine at the beginning of the operation.

Following is a short description of the procedure in constructing the machine. The wooden frame, consisting of the base and two ends, are cut to shape and size, as indicated on the working drawing. Also, the cylinder ends are cut from three-quarter stock, to the inside dimensions of the glass cylinder. The box for housing the electrical parts is cut and assembled. The frame pieces are then ready for the electric wiring, which are turned over to the electrical class in the school. The electrical parts, consisting of the wire, switch, and ballast were furnished out of the electrical shop, the latter being constructed by the class. The 65-watt fluorescent tube and starter were purchased in the open market, as they consist of standard parts.

While the wiring job is being completed, the pressure pad and wooden pad strip may be made. The pressure pad is made from ½-in. felt padding. It is cut a little shorter than the distance around the glass cylinder, so that when the pad is placed over the cylinder, it is necessary to stretch the elastic bands, holding the steel rod, in order to get the rod over the hooks on the pad strip. This insures an even pressure over the cylinder surface, necessary to keep the tracing and blueprint paper in position. The ends of the felt pad are bound with pieces of Demin cloth 2 in. in width, to insure an even pull, and to keep the pad in shape. One end of the pad is fastened by means of carpet tacks to the top side of the wooden pad strip, which is made according to the working drawing. On the beveled or lower side of the pad strip four hooks are evenly spaced over the length of the pad strip. These hooks receive the steel rod that is attached to one end of the pressure pad. To attach the rod to the pad, three strips of elastic band 2 in. wide and approximately 4 in. in length are sewed to the pad, one on either end and one in the middle. They are sewed so as to leave a loop at the end of the elastic strip. Through these loops a piece of 3/16-in. steel welding rod is inserted. Then the elastic band is stitched directly behind the rod, to keep the rod in place.

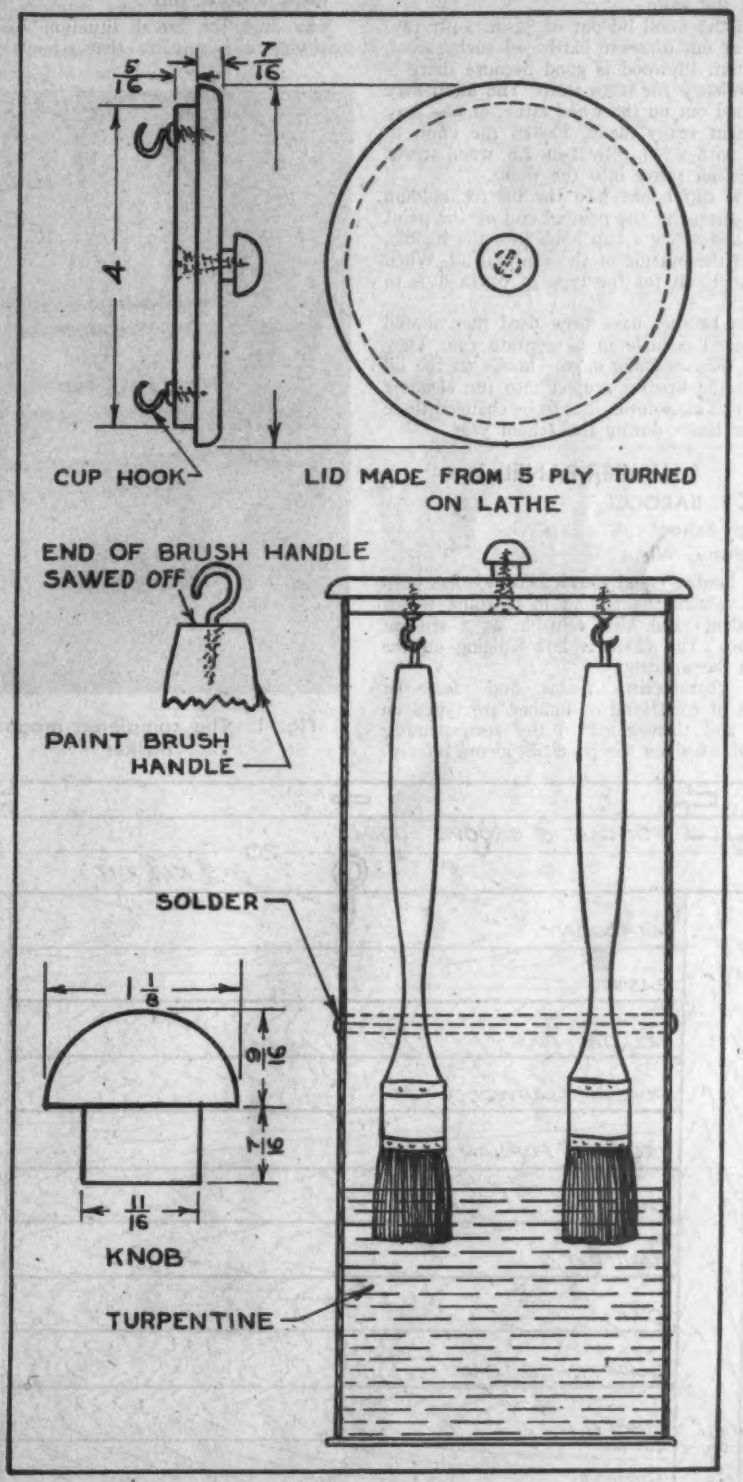
In assembling the machine after the wiring job is completed, take the pad strip, to which one end of the pad has been fastened, the glass cylinder, and the tube, and place them in their proper positions in the stationary end of the machine. It is well to place blocking under the other end of cylinder to hold it in approximate position for setting the movable end in place. After the movable end is in place, it is fastened by screws inserted from bottom of base. The socket in the movable end of the machine may then be set in place and fastened. After testing and checking the machine, the box for covering the starter, ballast, and wires is set in place. A cover for the machine, to prevent the glass cylinder from being broken, may be constructed out of ¾-in. plywood, large enough to cover the entire machine.

This type of blueprint machine makes an excellent project for vocational classes, and provides an inexpensive blueprint machine that is very useful in school drafting classes.

BRUSH CONTAINER

C. H. CONNALLY
High School
Overton, Tex.

The brush container illustrated here can be made out of empty quart oil cans, soldered together, and provided with a turned lid made of wood.



A convenient brush holder

Varnish, shellac, lacquer, and paint brushes must be either cleaned out well, and put away to dry after using them, or they must be placed in some solution which will keep them limber and ready for use at any time.

Four brushes can conveniently hang from the lid in one can.

Cut the bottom and top from one oilcan and the top from another. Clean both of the cans thoroughly and solder them together around the seam.

Turn the wood lid out of ¾-in. 5-ply plywood, or out of some hardwood such as oak or walnut. Plywood is good because there is less tendency for it to warp. The knob may be turned out on the wood lathe, or one may be bought ready made. Fasten the knob to the lid with a No. 8 by 1-in. f.h. wood screw. Countersink screw into the wood.

Screw cup hooks into the lid for holding the brushes. Cut the pointed end off the paint brush and screw a cup hook into the handle.

Paint the outside of the can and lid. When dry, label can for the type of brush it is to hold.

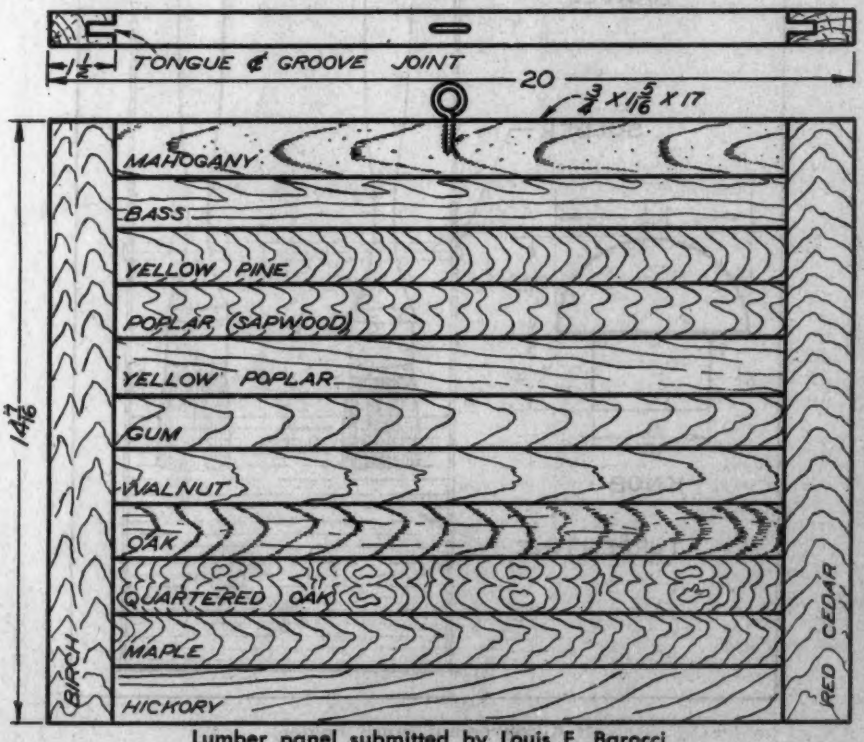
When brushes have been used they should be cleaned a little in a separate can. They should then be hung on the hooks on the lid so that the bristles project into the cleaning solution. This solution has to be changed three or four times during the school year.

LUMBER PANEL

LOUIS F. BAROCCI
High School
Cudahy, Wis.

The lumber panel shown herewith has been found valuable as an aid in teaching woods to students and also valuable as a student reference. The chart is left hanging on the wall in the woodshop.

The characteristics, uses, and places of growth of each kind of lumber are typed on paper and then glued to the corresponding strip of wood on the panel. Students refer to the panel before deciding on the kind of wood to use on a given project. The typing is given a coat of white shellac but the wood is left natural. The tongue-and-groove joint prevents the panel from warping.



Lumber panel submitted by Louis F. Barocci

MAGAZINE BASKET

N. H. POOLE
Emmerich Manual Training School
Indianapolis, Ind.

Now that the metal situation has eased somewhat it is possible that schools will be able to buy mild steel from hardware, steel, or salvage dealers. This project is well suited for bench and cold metalwork, and involves layout, measuring for circles, bending, duplicating parts, drilling, riveting, and bronze finishing of metal.

Fig. 1. The completed magazine basket

If this is used for a class project the magazine basket shown in Figure 1 should not be started until jigs are made so that all parts will be uniform in shape and size. However, if one or two boys choose this as one of their jobs, additional training can be given the boys by having them devise their own jigs and bending aids. All the jigs illustrated in this article were worked out by students. Figure 1 shows a completed basket.

In constructing this project the details of

Fig. 3. Forming the loops at the ends of the upright

Fig. 4. Bending the uprights to shape

Fig. 5. Forming the center piece

which are shown in Figure 2, the following sequence of work has been used.

1. Cut the metal for the uprights of the basket to the proper length and bend one end of each around a piece of pipe or conduit as is shown in Figure 3. All bending should be done in a vise and no hammering should be done on the parts.

2. The next step is to bend these upright pieces so that all are the same size and shape. Figure 4 indicates how this can be accomplished.

3. After forming the uprights, match them in pairs and drill the ⅛-in. holes.

4. Now bend the center piece, which makes the handle as in Figure 5. It is best to start from one end and make the various bends so that they correspond to a full-size pattern or blueprint as is shown in Figure 6.

5. Next the six pieces for the sides and one for the stretcher are cut and the ends rounded. The required ⅛-in. holes for the roundhead rivets are then drilled.

6. Cut and bend the two pieces for the top of the uprights. The right angle bends on the ends of these pieces are to be bent at an angle to fit the slope of the uprights.

7. Cut and form the pieces that fit around the body of the basket.

8. All parts are assembled with stove bolts, which are then replaced one by one with roundhead rivets.

Fig. 6. Forming the center piece

9. Rough ends and surfaces should be rounded and smoothed and all scale cleaned off.

The bronze finish is made by mixing bronze powder in flat black enamel or lacquer. This should be mixed so that the finish material is a little thicker than paint and should be applied with a soft hair brush. One heavy coat is sufficient. After the finish dries wipe the parts with a clean cloth to remove excess bronze powder. Carefully examine the entire job, and retouch any skips that may have been left.

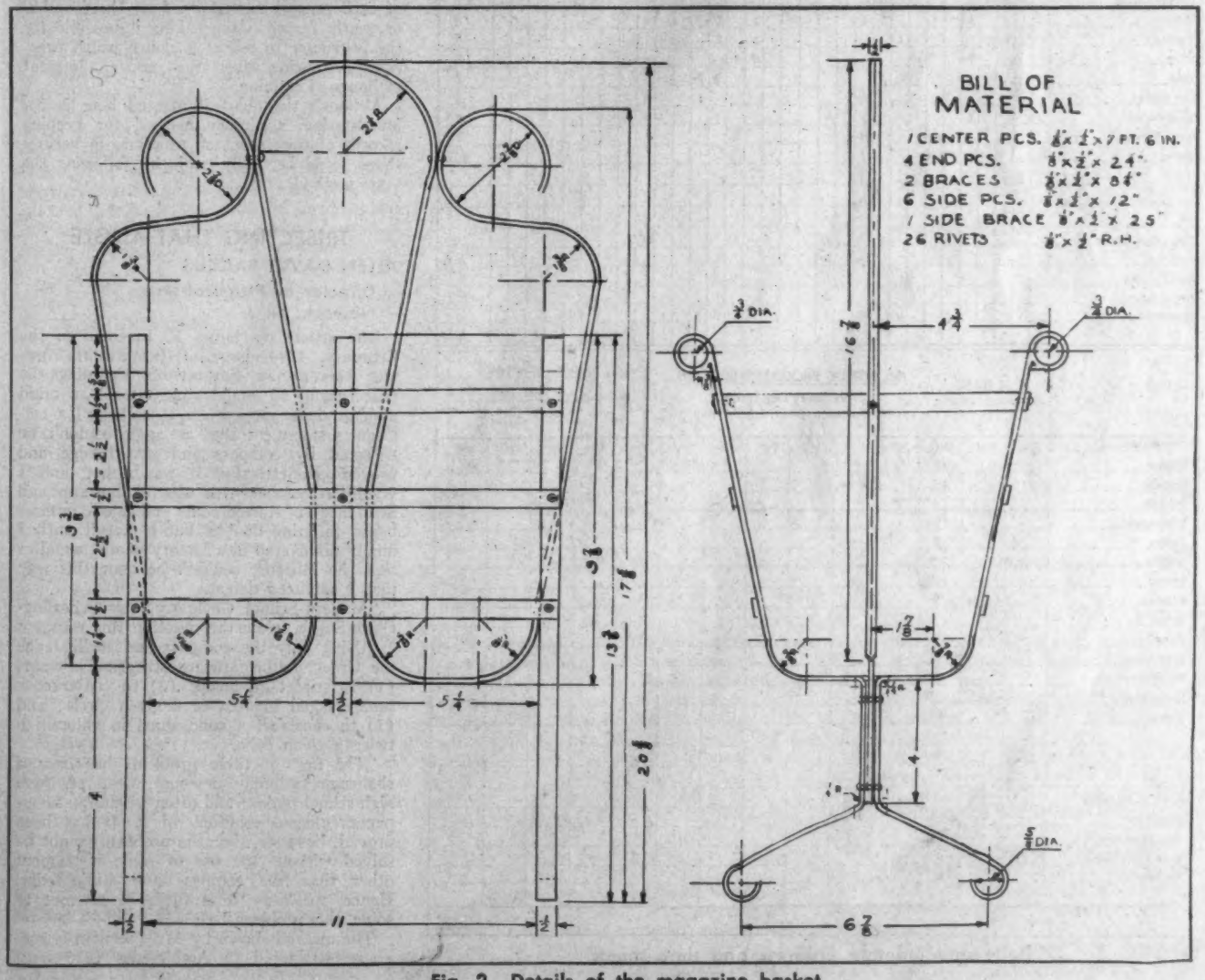


Fig. 2. Details of the magazine basket

PROGRESS AND TIME CHARTS FOR UPHOLSTERING

HERBERT BAST

Sheboygan Vocational School
Sheboygan, Wis.

Through the Veteran's Rehabilitation Department, the Sheboygan Vocational School is training discharged veterans of World War II in upholstering.

One veteran, with some previous training before entering the service, has received training in upholstering to the extent that he has already established a business in upholstery repair in his home town. Another veteran, with no previous experience in upholstering, is progressing so rapidly that he, too, is looking forward to establishing his own business in his home town.

Veterans being trained as upholsterers at the Sheboygan Vocational School

When a veteran enters the school, he is given the type of training which he desires. Either he wishes to be an upholsterer and secure employment in industry, or he prefers to establish an upholstery shop of his own. The latter requires a more diversified program. It involves more training in technique, such as: familiarities and qualities of coverings; purchasing covers and supplies; estimating and selling; woodwork and wood finishing; to the extent which they are required for upholstery repair. Mathematics, such as planning and layout of covering for all types of upholstered furniture, is also stressed.

The various jobs in upholstering are broken up into processes, each process having an allotted amount of time in which a student should be trained. This is done so that the proper amount of training will be given on all processes. Then, too, certain processes are allotted more hours for training than others. Processes such as springing, covering, tufting, and piping require more hours of training than do gimping and making buttons.

The time spent daily on each process on which the veteran worked is entered on a monthly progress record. This record is kept by the veteran himself who checks it with the instructor daily, the instructor making a duplicate from the veteran's daily report.

At the end of each month the total hours of each process are recorded on the monthly or yearly record, thus making it possible for the instructor to tell at a glance which processes are being given the proper allotment of hours of training.

Although the chart illustrated here is for upholstering, a similar method for keeping records of time spent on processes in various shops could be easily made by following the same method.

October 194[illegible] — H. BAST, INSTRUCTOR — MONTHLY PROGRESS RECORD — Upholstery Department — SHEBOYGAN VOCATIONAL SCHOOL — Name Francis Everett — Address 824 - New York Ave. — Day Daily

UPHOLSTERING	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
Webbing			1	1/2		1						1				2								2			1				1	11
Springing		2		3		3			3			2				2								3			2				2	22
Roll-Edge		1	2			1			1			1				1								1			1				1	10
Stitched-Edge		1		2		3					2	2																			2	12
Stuffing		2							3	1						1								1	2	2					1	13
Covering		2	2	1						3		2				2								1	4	2				2	1	22
Outside			1		2					1	1						2		2	1					2							12
Trimming			2						1								2		2											2		9
Tufting					4												4	4														12
Piping																			3	3										2		8
Inner Spring										2										3			2	1								8
Filling Cushion					2							2							1					1	2						2		10
Making Buttons										1/2							1/2															1
Zipping										1							1 1/2		1					1								4 1/2
Power Mach. Sewing									3								2						5									10
Wood-Work										1/2		2							2													5 1/2
Wood Finishing												1							2					1								4
Related Information												2							1					1								4
Mathematics												1							3					2								6

1943 to 1944 — H. BAST, INSTRUCTOR — MONTHLY PROGRESS RECORD — Upholstery Department — SHEBOYGAN VOCATIONAL SCHOOL — Name Francis Everett — Address 824 - New York Ave. — Day Daily

UPHOLSTERING	Hrs.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Total
Webbing			11											
Springing			22											
Roll-Edge			10											
Stitched-Edge			12											
Stuffing			13											
Covering			22											
Outside			12											
Trimming			9											
Tufting			12											
Piping			8											
Inner Spring			8											
Filling Cushion			10											
Making Buttons			1											
Zipping			4 1/2											
Power Mach. Sewing			10											
Wood-Work			5 1/2											
Wood Finishing			4											
Related Information			4											
Mathematics			6											
													Grand Total	

Daily and monthly progress and time sheets

TRISECTING THAT ANGLE

ALLEN DAVID BACKUS

Director of Practical Arts
Newark, N. J.

The article by James F. Freeman in the February, 1944, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, regarding the trisecting of an angle, brought back to mind undergraduate days when I challenged a colleague's statement that an angle couldn't be trisected by compass and straightedge and proved geometrically. It was a bet, and I vividly remember with what enthusiasm and assurance I started out; repeated failures began to bring doubts, but it wasn't until I finally discovered in a history of mathematics that the job just couldn't be done this way that I admitted defeat.

"Modern-School Geometry," by Schorling-Clark-Smith treats the question this way:

"Using only the compass and straightedge the Greek mathematicians struggled in vain: (1) to trisect an angle; (2) to construct a square equal in area to a given circle; and (3) to construct a cube equal in volume to twice a given cube.

"The first of these problems has been a challenge to many persons (some of them high school pupils) and often we find in newspapers alleged solutions of it. It has been proved, however, that the problem cannot be solved without the use of some instrument other than the compass and straightedge. Hence, we know it is futile to attempt to solve the problem."

The method shown by Mr. Freeman is generally attributed to Archimedes (225 B.C.)

and is in error in that the construction is mechanical rather than geometrical. In his directions for construction Mr. Freeman says (see Fig. 1 as submitted by Mr. Freeman): "Draw a straight line B C F, making B C equal to the radius of the circle and passing through point D on the circumference of the circle." On this line B C F apparently only one point, D, is shown. I assume then that point C is located by playing around with the straightedge and dividers until the conditions postulated are obtained, or by marking the radius on the straightedge; such mark-

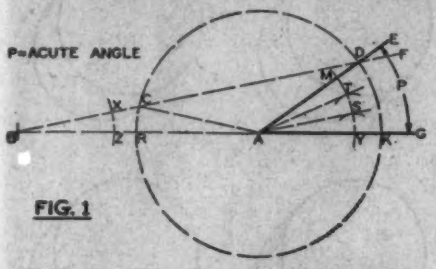


FIG. 1

ings, however, can be no part of Euclidian geometry. The proof of geometric reasoning set forth then has nothing whatever to do with the method of finding the angle desired. It would be as reasonable (or perhaps I should say unreasonable) to divide the arc D K into three equal parts by stepping off with the dividers and then proceed to prove by geometric construction that the angles thus formed were each one third of the angle G A E.

The drawing and construction do credit to the students of the Erie Technical High School. The so-called proof provides a challenging exercise in geometric reasoning, and all who participated should be commended. But let's be realistic about having shown the ancient Greeks how it could be done.

CABINET DRAWING

W. W. STURTEVANT
South High School
Minneapolis, Minn.

(Continued from page 304 of the September, 1944, issue)

Plate 10 shows some examples of more difficult irregular shapes. In drawing these a three-view mechanical drawing should be made first and measurements taken from the front and side views as needed.

Often the use of sections as used in mechanical drawing will help to make a cabinet drawing clearer.

The crosshatching lines used in mechanical drawings are usually drawn at a slope of 45 deg., but because the 45-deg. angle is used in cabinet drawing this angle is not as satisfactory for the section lines. Hence, lines slanting at 30 or 60 deg. may be used.

Plate 11 shows the use of sections.

Dotted lines are usually omitted in pictorial drawings, but in drawing some objects their use results in a clearer picture.

The dimension lines used on cabinet drawing are vertical, horizontal, and at an angle of 45 deg. One of the rules of dimensioning in mechanical drawing is that dimensions should be kept between the views and off of the drawing, if possible, but in many cases in making pictorial drawings a more satisfactory result may be secured by placing the dimensions on the drawing.

Figure 11 shows how dimensions may be placed. Usually keeping the dimensions close to the picture or on it is more pleasing.

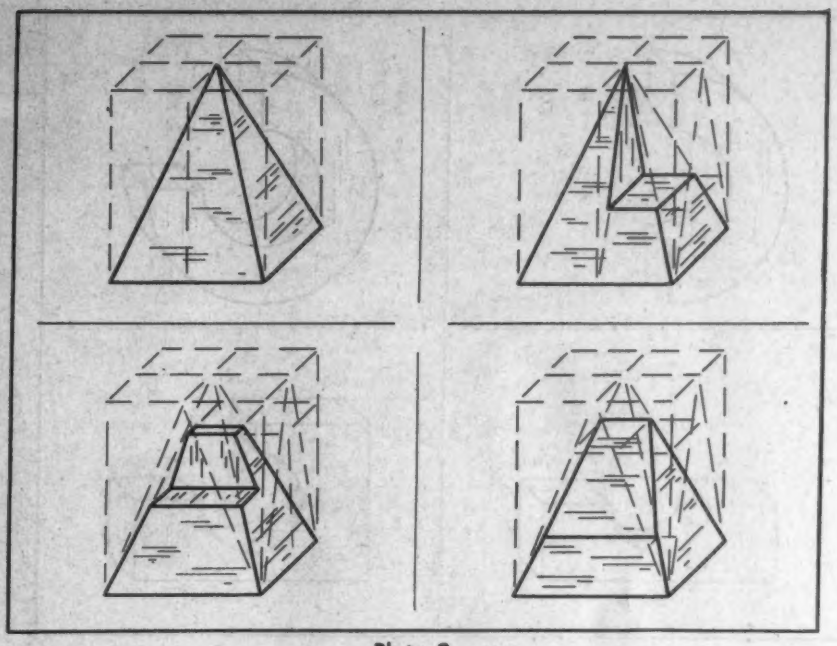


Plate 9

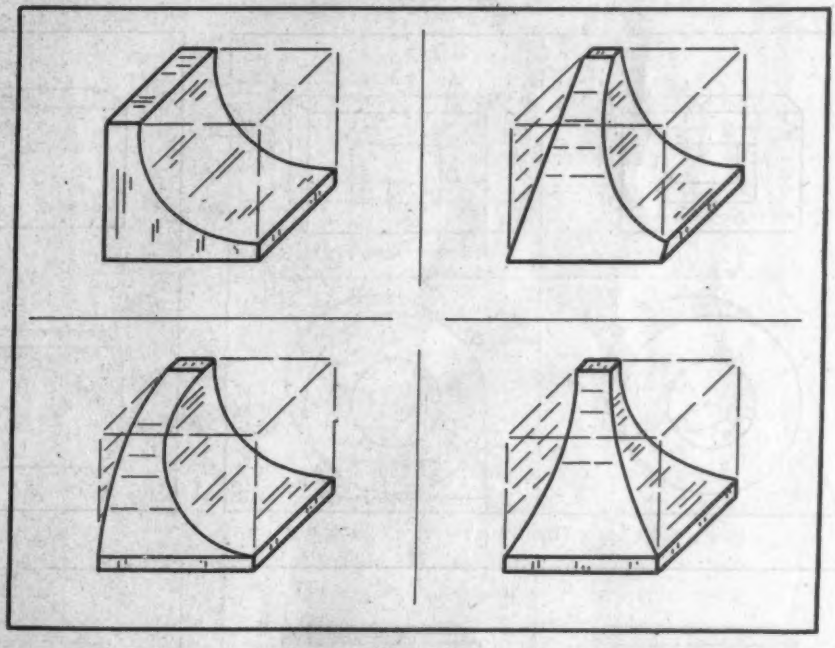


Plate 10

Pictorial drawings present a more pleasing appearance if the surfaces are indicated by shading. When the drawings are in pencil the shading may be done with a 2H pencil but if they are in ink, line shading is more satisfactory. More advanced pupils may use a wash and thus bring out the object better.

The lines may be drawn vertical, horizontal, or at 45 deg. as shown in Figures 12 and 13.

Circles may be shaded with straight lines or with arcs. See Figure 14.

The straight lines may be drawn much more quickly and usually result in a better looking drawing except where the arcs and straight lines may be combined.

One of the most common mistakes of pupils is to use too many lines and to place them too close together thus producing a spotty appearance.

A few well-placed lines will do better than a larger number. The idea is to suggest surface — not to attempt to draw it.

A point to be kept in mind by the instructor in making drawings of exercise blocks is to see that all parts of the block are clearly shown so that the pupils can see what the shape of the block is.

The first exercise in Figure 15 is objectionable, because the pupil cannot be sure whether the holes go clear through the piece, or that the notches go straight back as they show on the front surface.

The other drawings show how these difficulties have been avoided by drawing a thin-

ner block and by changing the proportions and angles so that little doubt should exist as to the actual shape of the block.

In checking cabinet drawings it will usually be found that omissions are far more common than mistakes. Lines are left out more often than they are incorrectly drawn. Pupils should be taught to check carefully so that they will have all drawings complete.

(To be continued)

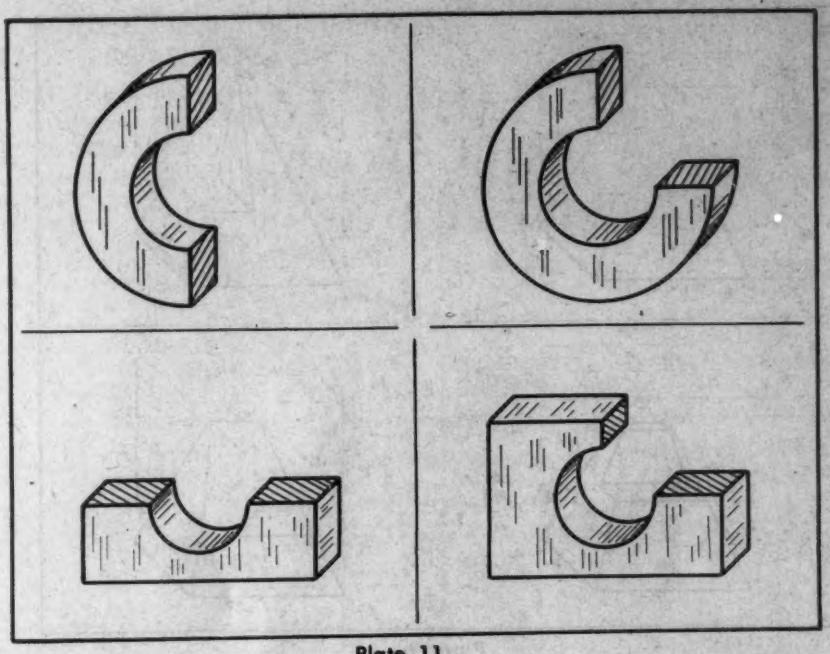


Plate 11

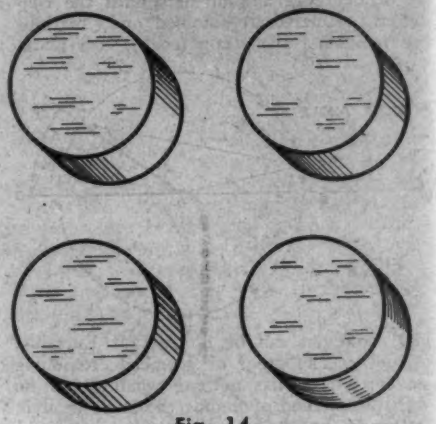


Fig. 14

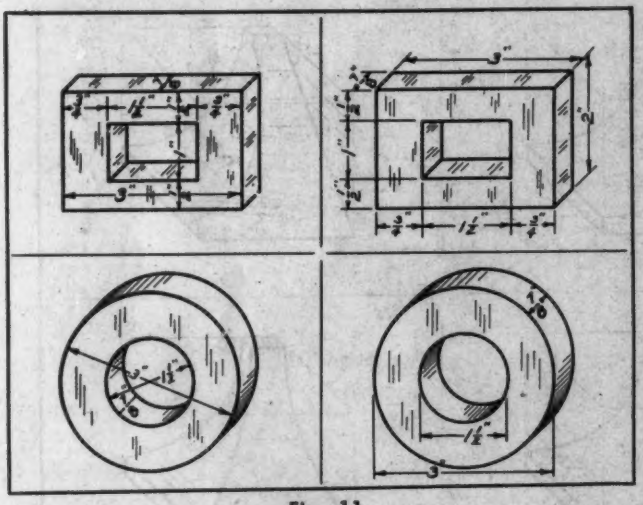


Fig. 11

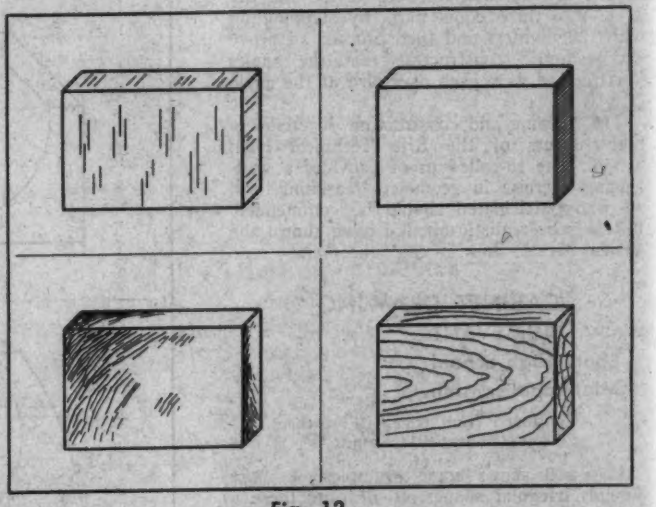


Fig. 12

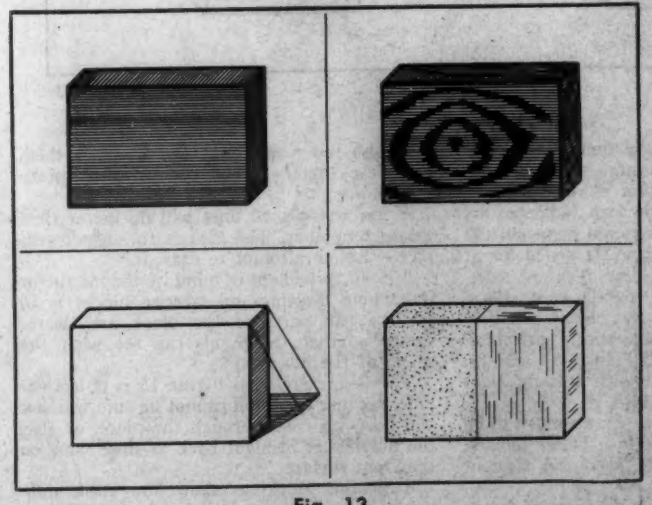


Fig. 13

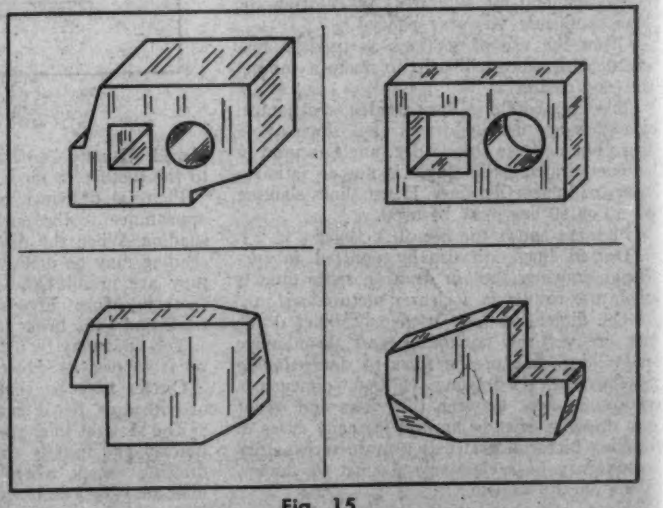


Fig. 15

Pioneer in Education

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Personal News

APPOINTED STATE SUPERVISOR OF INDUSTRIAL ARTS

Arthur F. Ahr, of Beacon, N. Y., was appointed senior education supervisor of industrial arts in the Bureau of Industrial and Technical Education, The State Education Department, Albany, N. Y. The appointment became effective on July 1, 1944.

Mr. Ahr is a graduate of Buffalo Technical High School, and was granted the degree of bachelor of science in industrial-arts education from State Teachers College at Buffalo. Part of his undergraduate work was taken at Carnegie Institute of Technology and The University of Pittsburgh. He has also done graduate work at the University of Buffalo, New York University, and Cornell University.

He taught two years in the Harding High School in Woodlawn, Pa., ten years in the Buffalo Public Schools, Buffalo, N. Y., and seven years in Beacon High School, Beacon, N. Y.

During summer vacations he has instructed industrial-arts classes in State Teachers College at Buffalo, and Cornell University. The summer session work at Cornell included both undergraduate and graduate courses in industrial-arts education.

His first assignment in the state education department was during the school year of 1942–43 when he served as consultant in junior aviation in the Bureau of Industrial and Technical Education.

Mr. Ahr's appointment now gives New York two supervisors of industrial arts.

MAJ. WARNER ON GEN. EISENHOWER'S STAFF

Plans of the Allied high command for "de-Nazifying" the Fire and Civil Defense services in Germany and other enemy countries are in charge of Maj. William E. Warner of Columbus, Ohio, an officer of the G-5 (Civil Affairs) Division at Supreme Headquarters Allied Expeditionary Force. This is a phase of the public safety program for Europe, under direction of Col. T. E. St. Johnston.

As a staff officer for Gen. Eisenhower, Maj. Warner also is in charge of reactivating all Fire Defense and Civil Defense services in the liberated nations of Europe.

Maj. Warner, a native of Illinois, is the son of Prof. and Mrs. I. N. Warner of Platteville, Wis. Prof. Warner is an emeritus member of the teaching staff of the State Teachers College at Platteville.

Maj. Warner, a Ph.D., of Columbia University, has been a professor of education at The Ohio State University, Columbus, since 1925. He served as consultant with the United States Office of Civilian Defense in Washington in 1943, aiding in the development of a training program for protecting American Industrial plants from sabotage and other enemy acts.

Upon being commissioned in the Civil Affairs Division of the United States Army in 1943, Maj. Warner attended the Provost Marshal General's School at Fort Custer, Mich., for basic training in civil affairs operations. He was sent to the European Theater of Operations last winter and in England attended the Civil Defense Staff College of the British Ministry of Home Security. Completion of the course there led to his assignment to Supreme Headquarters.

Maj. Warner is on military leave from The Ohio State University and expects to return to his post at Columbus following the war.

♦ Amos G. Williams, associate professor of industrial arts at Wayne State Teachers College, Wayne, Neb., has been granted a year's leave of absence to join the faculty of the Southeast Missouri State Teachers College, Cape Girardeau, Mo.

Mr. Williams will act as assistant to Dr. Kenneth L. Bing, head of the department of industrial arts at Cape Girardeau, and will assist in teaching engineering drafting and descriptive geometry to Navy V-12 classes in the department.

A. G. Williams

Mr. Williams was granted the degree of master of science at Iowa State College, Ames, in 1936, and was appointed professor of industrial arts at Western Union College, Le Mars, Iowa, continuing in the position until March, 1942, when he was elected associate professor of industrial arts at the Wayne State Teachers College, Wayne, Neb., under Professor Raymond A. Schreiner, head of the department.

In addition to his departmental work, for the past two years Mr. Williams taught military geography, civil air regulations, and meteorology in the 349th College Training Detachment of the AAF's West Coast Training Command based at the Wayne campus.

♦ Dr. Harold W. Bentley, associate director

(Continued on page 24A)

BUILDING BOEINGS B-29

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(Continued from page 22A)

of the Columbia University Press, has been appointed director-librarian of the Benjamin Franklin Library in Mexico City. The library is administered by the American Library Association on behalf of the U. S. Department of State, and is operated as a typical public library in an average American city. The library was opened in 1942.

Dr. Bentley is a graduate of Columbia University and the Columbia University School of Library Service. He has been on the staff of the New York Public Library and the Carnegie Foundation for the Advancement of Teaching.

♦ GEORGE H. FERN, director of the State Board of Control for Vocational Education, Lansing, Mich., represented the American Vocational Association and the National Education Association at a conference on educational legislation in Washington, August 10, 11, and 12.

♦ DR. WM. F. RASCHE, director of the Milwaukee Vocational School, Milwaukee, Wis., has received the 1944 Cosmopolitan Club award for distinguished community service.

The jury named to select the recipient of this honor unanimously chose Dr. Rasche because of his unselfish devotion and outstanding contributions to community welfare during the past year.

♦ DR. EUGENE S. LAWLER, professor of education, who has been chief of the research and statistics section of vocational training for War Production Workers in the United States Office of Education, has resumed the teaching of school administration in the School of Education, Northwestern University, September 25, 1944.

♦ R. B. MCHENRY, who has served for the past four and one half years as Director of Industrial and Adult Education, Tulsa, Okla., public schools, resigned, effective August 1, to accept a position as assistant to the general production superintendent of the Gulf Oil Corporation. In his new position he will direct a newly organized division of industrial relations for this company.

In his position with the Tulsa schools, Mr. McHenry directed the trade and industrial, distributive, industrial arts and vocational training for War Production Workers programs. For twenty years he has served as instructor, coordinator, and director of industrial, distributive, and adult education in Oklahoma, Arkansas, and Washington, D. C.

♦ R. H. ROBERTS, who was director of industrial arts in the Winfield, Kans., public schools for 15 years, and more recently an instructor in the industrial education department of the Tulsa, Okla., schools, and, since May, 1943, area training supervisor for the War Manpower Commission, succeeds R. B. McHenry as director of industrial arts and vocational education. Mr. Roberts will have charge of all industrial arts and vocational training in the regular school program and the vocational training for War Production Workers program.

♦ M. J. RULEY, who has been in the Tulsa, Okla., school system for 11 years, will direct the Adult Education Program for the Tulsa public schools. During the past two years, Mr. Ruley has been co-ordinator of the Cooperative Part-Time Program, and will continue to serve in that capacity. He has also served as Administrative Assistant to R. B. McHenry in the VTWPW program until two years ago, and during the past two years in the Adult Education Program. He also served for six months as Assistant State Supervisor of Trade and Industrial Education in Oklahoma.

♦ C. A. JOHNSON who has been vocational director in the Houston, Tex., schools since 1928, has been appointed supervisor of vocational work at the University of Houston. He is a graduate of the University of Texas, and previous to his coming to Houston was instructor in drawing at North Texas Agricultural College. He also taught at San Antonio, Tex., for a short time.

♦ ARTHUR WALKER has been appointed co-ordinator of the cooperative office training program at Western Michigan College of Education in Kalamazoo, Mich.

♦ ELIZABETH CLAUGHERTY has been appointed co-ordinator of the cooperative office training program at the Fordson High School in Dearborn, Mich. She has been a teacher in the commercial department of the Fordson High School for the past several years.

♦ J. M. GUSTAFSON is the co-ordinator of the newly organized cooperative business training program in Northern Michigan College of Education at Marquette, Mich.

Mr. Gustafson has been an instructor in the commercial department of the Marquette High School. He is a graduate of Northern Michigan College of Education and has studied at Northwestern University and the University of Michigan.

♦ A. L. BURGER, who served as director of trade and industrial education in Lynchburg, Va., since its organization, died of a heart attack on July 25. Mr. Burger also served as supervisor of Lynchburg Schools.

♦ CLIFFORD C. FOX, who has been acting as supervisor of trade and industrial education, and in charge of the war-production training classes in Lynchburg, Va., since 1940, has been appointed director of trade and industrial education in that city.

♦ H. C. PALMER has been appointed co-ordinator-instructor of the Chanute, Kans., cooperative part-time program.

♦ WARREN G. MEYER, supervisor of distributive education, Pittsburg, Kans., was granted a leave of absence, and has accepted a commission in the U. S. Navy as Lieutenant (j.g.).

♦ FRANK VIETTI has been appointed as acting supervisor of distributive education to succeed Warren G. Meyer for the duration. Mr. Vietti is a graduate of Kansas State Teachers College, Pittsburg, and a resident of Pittsburg. He has also done graduate work at Chicago University, the University of Southern California, and Tennessee University. He has taught business courses at Tulsa, Okla., and Des Moines, Iowa; was assistant supervisor and teacher trainer for distributive education in Puerto Rico for one year; has had practical experience as owner and operator of a

(Continued on page 27A)

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Manual training instructors frequently stress the importance of quality in tools—particularly cutting tools. It is a lesson all student craftsmen should learn early and remember long. An excellent way to illustrate this lesson on quality is to show the Disston tools you are now using, and to tell about the wear resistance of Disston steel.

The fact that Disston tools can absorb the daily punishment inflicted by the inexpert, sometimes careless, hands of many succeeding classes, is convincing proof of Disston endurance and Disston quality.

Because of the urgent need by Government and Industry for Disston tools, only a limited number can be made available for school workshop use. But if you are training students for essential work, and require tools, ask your hardware dealer about Disston tools.

Each of your students should have a copy of the Disston Saw, Tool and File Manual. It contains valuable information that will prove helpful both now and in future practice. Copies will be supplied *free* by local hardware dealers.

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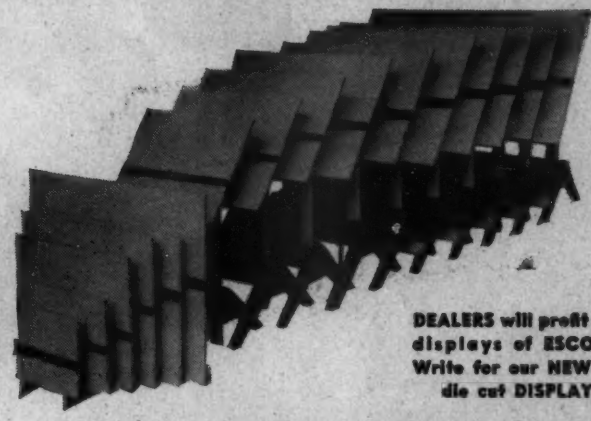

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These modern texts have been especially prepared for school use. You can employ them to excellent advantage in your War Training and regular programs as well as your rehabilitation work. An examination will convince you of their suitability to your classroom needs. Any books sent for 30 days ON APPROVAL inspection subject to our educational discount if retained.

Slide Rule Simplified (with rule)	$3.50
Slide Rule Simplified (without rule)	2.50
Fundamentals of Radio and Workbook (PIT)	2.50
Fundamentals of Electricity and Workbook (PIT)	2.50
Fundamentals of Machine and Workbook (PIT)	2.50
Fundamental Shop Training and Workbook (PIT)	2.50
Diesel Locomotives (Mechanical Equipment)	4.00
Diesel Locomotives (Electrical Equipment)	3.75
Aircraft Sheet Metal Blueprint Reading	2.50
Aircraft Sheet Metal Work	3.75
Plane Trigonometry Made Plain	2.75
Metallurgy	2.50
Shipbuilding Blueprint Reading	3.00
Tool Design	4.50
Plastics (enlarged 2nd edition)	3.75
Electrical and Radio Dictionary	1.00
How to Read Electrical Blueprints	3.00
How to Remodel a House	4.75
How to Plan a House	4.50
*Flight—Aviation Engines	3.25
*Flight—Meteorology, Aircraft Instruments & Navigation	3.25

*Note: These books have been listed in Leaflet No. 68 issued by U. S. Office of Education

(TEAR OFF HERE AND MAIL TO US)

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$7.50 Complete With 20 Engraving Needles

Cutting patterns from cardboard.

(HANDICRAFT DIVISION)

BURGESS BATTERY COMPANY

196 N. Wabash Avenue Chicago 1, Ill.

(Continued from page 24A)

Firestone Store at Miami, Okla.; and was auditor for the Kansas State Board for Vocational Education.

♦ PLUMMER P. INNES has been appointed by Supt. W. J. Graff to serve as director of the evening school program at Independence, Kans. For the past two years Mr. Innes has been co-ordinator-instructor of the cooperative part-time office training program in which capacity he will continue to serve.

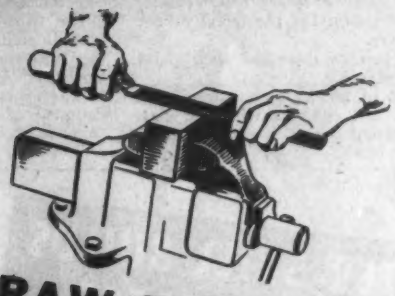
♦ EDWIN A. MARSHALL is the co-ordinator-instructor of the new cooperative part-time retail program at Atchison, Kans. He has been director of vocational education and an instructor in the commercial department at Atchison during the past year, and has been getting selling experience in the J. C. Penney Co. store at Atchison. Mr. Marshall is a graduate of the Missouri Teachers College, Maryville, Mo.

♦ PERDUE B. GRAVES has replaced Kenneth Meyers as co-ordinator-instructor of the cooperative part-time retail program in Topeka, Kans. Mr. Graves retains his position as director of adult education of the Topeka Public Night School.

♦ ELMO A. BETTEGA has replaced Miss Nelle West as co-ordinator-instructor of the cooperative part-time program at High School East, Wichita, Kans. Mr. Bettega was formerly an instructor in the commercial department of High School East, and for the past 15 months he has been staff assistant in the administrative office of Beech Aircraft Corp., Wichita. He is a graduate of Kansas State Teachers College, Pittsburg, Kans.

♦ CLARENCE A. SWENSON is the new co-ordinator-instructor of the cooperative part-time retail program at the Hutchinson Junior College, Hutchinson, Kans. Mr. Swenson was formerly an instructor in the Commercial High School, Atlanta, Ga. He was store co-ordinator and employee trainer at Sears, Roebuck & Co., at Atlanta, from which position he comes to Kansas to enter the distributive education program. Mr. Swenson will work under the direction of Dean C. M. Lockman. He has a master's degree from Kansas State Teachers College, Pittsburg, Kans.

Filing Hints to meet war-time needs



DRAW-FILING

Draw-filing may be defined as alternately pulling and pushing a file over the work in such a way that the length of the file is transverse to the direction of motion. It is employed wherever a smooth, level surface on planes or edges is desired.

As the beginner can see from the illustration, the file is held with both hands, —with the fingers on the edge away from the filer's body and the thumbs on the edge toward the body. The file is then alternately pulled toward the body, and then pushed away from the body. One advantage of draw-filing is that the file can be held steady. A fine surface finish is secured without scoring or scratching. Ordinarily a Mill Bastard File with a long angle should be used so that the metal is cut with a true shear or shaving action.

In learning to draw-file, there is a tendency to apply most of the effort when the file is in the middle of its stroke. This is likely to develop a hollow spot that must be guarded against by a careful check-up after the filing is completed.

☆ ☆ ☆

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Association News

♦ The Alpha Chapter of Epsilon Pi Tau, at the Ohio State University, Columbus, Ohio, held its fourteenth annual initiation and banquet on August 16, 1944.

The initiates were: Graham W. Brollier, Everett L. Bushong, S. Raymond Hackney, J. M. Honeychuck, Kenneth I. Lea, Robert T. Mansfield, Henry B. Myres, and Paul G. Spence.

The present officers of Alpha Chapter are: James N. Casey, president; C. Merrill Hamilton, vice-president; Michael F. Blawat, secretary-treasurer; and Dr. Robert E. Smith is the faculty sponsor.

The initiating team on this occasion consisted of: Honorable Basileus, James N. Casey; Hegemon, Michael F. Blawat; Phylax, George J. Bilsey; Historiographos, Willis A. Whitehead; Texnikh, Michael F. Blawat; Pragmateia, C. Merrill Hamilton; Exetasis, R. Lee Hornbake; Trustee, Robert E. Smith; Awarding of Keys, R. Lee Hornbake; and Programs, George J. Bilsey.

♦ Deans of engineering schools in all sections of the midwest met in Chicago, October 7, to confer with the educational committee of the Diesel Engine Manufacturers Association. It is expected that out of the conference will come material help to the schools in bolstering and enlarging their courses of instruction in Diesel engines.

♦ The Reading Clinic Staff of the School of Education, The Pennsylvania State College, State College, Pa., is sponsoring two important meetings on reading problems during 1945.

The Annual Seminar on Reading Disabilities will be held from January 29 to February 2, 1945. Demonstrations and discussions on a differentiated program for analyzing and typing, or classifying, reading disabilities will be conducted by the staff of the Reading Analysis Unit of the Reading Clinic. Remedial techniques will be demonstrated and discussed by the staff of the Reading Clinic Laboratory School.

From June 26 to June 29, 1945, the Reading Clinic Staff will conduct the Annual Conference on Reading Instruction. This Conference deals with classroom problems.

Copies of the program may be obtained from Miss Betty J. Haugh, Reading Clinic Secretary. —*Emmett A. Betts.*

♦ Eric A. Johnston, president of the Chamber of Commerce of the United States, and member of the Sponsoring Committee of the International Business Conference, announced recently that representative groups of outstanding business personalities from the United States and neutral nations will attend a world-wide gathering at the Westchester Country Club, Rye, N. Y., November 10 to 18, to discuss postwar world trade and commerce.

Topics on the Conference agenda will be wholly international in scope. While the scores of delegates will develop the full scope of their own discussions, subjects so far suggested include: commercial policy of nations; currency relations among nations; industrialization in new areas; transportation and communication; raw materials; cartels; and encouragement and protection of investments.

Temporary Conference headquarters is in Room 716, 10 Rockefeller Plaza, New York City.

Answers to Questions

PUTTY FOR METAL SASH

1108. Q.: We are having considerable difficulty securing the proper putty for glazing metal sash.

(Continued on next page)

(Continued from previous page)

Could you give us some information on ingredients for making a suitable putty? — *G. R. S.*

A.: The putty for metal sash can be made quite practically as follows:

One pound of soft paste lead
Two pounds of whiting
Two teaspoonsful of castor oil

Enough outside house paint of the finished color to make the batch of the desired knifing consistency when worked in the hands. The sash should be scratch brushed with a one-inch steel brush, dusted and then coated with a standard red lead paint or other metal primer before applying the putty. Let the metal primer dry hard, then putty.

Let the putty surface dry and then paint with the finish trim color.

Due to the trace of nondrying castor oil this putty will expand and contract with the glass and metal. If the priming coat is properly dried the putty will not crack. — *Ralph G. Waring.*

News Notes

♦ The Board of Regents of the University of the State of New York has granted permission to change the name of the Rochester Athenaeum and Mechanics Institute to Rochester Institute of Technology, James E. Gleason, chairman of the Institute's board, announced recently. The action came as a result of a petition which was submitted to the Board of Regents by the Institute officials early in May.

The title, Rochester Institute of Technology, is considered more descriptive of the work which the Institute is now doing than the old name, Rochester Athenaeum and Mechanics Institute, it was explained. It means, however, the abandonment of a title which has been in existence since 1829 when the Rochester Athenaeum was founded by community leaders with Col. Nathaniel Rochester as the Athenaeum's first president.

Mechanics Institute, the name by which the Institute usually was known, was founded in 1885 by Capt. Henry Lomb and a group of Rochester industrialists and merged with the Athanaeum in 1891. Dr. Mark Ellingson, Institute president, explained that "students and graduates of the Institute have long sought a more descriptive name. They have felt that the old name was not an adequate description of the high quality of technological and industrial work which is now being carried on." Use of the new name is to begin immediately. Besides the name change, the Regents also approve the application of the Institute for change of the name of the governing board from Board of Directors to Board of Trustees.

♦ Fundamental farm skills — horseshoeing, sheep shearing, repairing tractors and mowers — are now being taught by motion pictures produced by the U. S. Office of Education, Federal Security Agency, to speed up the war training of much needed farm workers.

To offset the shortage of new farm machinery, a series of six films has been produced on the maintenance and repair of farm equipment — mowers, grain drills, cultivators, tractors, and two-bottom tractor plows. The films show farmers how to keep old equipment in good working order and what to do if a piece of machinery breaks down.

Each subject is covered thoroughly so that farmers who see a picture know what to do first, second, and so on, what tools to use, what safety precautions to follow.

Besides the six pictures on the maintenance of farm equipment, there are films on horseshoeing, sheep shearing, community canning, and repainting frame buildings.

In addition to the motion pictures, the Office of Education has prepared film strips which review and clarify important points in the films, and instructor's manuals which tell the best ways of using the visual materials. The motion picture, film strip, and manual form what the Office of Education calls an "instructional unit of visual aids."

The motion pictures and film strips may be purchased from Castle Films, Inc., 30 Rockefeller Plaza, New York, the contractual distributor of all Office of Education visual aids. They may also be rented from many 16mm. educational film libraries. Copies of instructor's manuals are furnished without charge by the Office of Education to users of the films.

♦ Postwar employment prospects in 16 occupations are described in 16 different six-page Occupational Abstracts just revised and published by Occupational Index, Inc., New York University, New York 3, N. Y., at 25 cents each. The occupations covered are: building contractor, rural teacher, detective, cabinetmaker, radio service, window display, butcher, free lance writer, plasterer, air-conditioning engineer, patternmaker, landscape architect, bus and truck driver, linotype operator, accountant, and architect.

Each abstract summarizes available information on the nature of the work, abilities and training required, earnings, number and distribution of workers, advantages, disadvantages, and postwar prospects. Sources of further information and best references for additional reading are included.

♦ A seven-point program to inform the public of the profession of pharmacy's contribution to public health was advanced by M. P. Coyle, of the National Pharmacy Committee, at the annual meeting of the National Association of Boards of Pharmacy held at Cleveland, Ohio, recently.

The program as outlined by Coyle follows:

1. Inform the public when state examinations are held and just what the requirements for those taking the examination are.
2. Inform the public what the licensee must do to pass the state examinations.
3. Inform the public how the prospective

(Continued on page 30A)

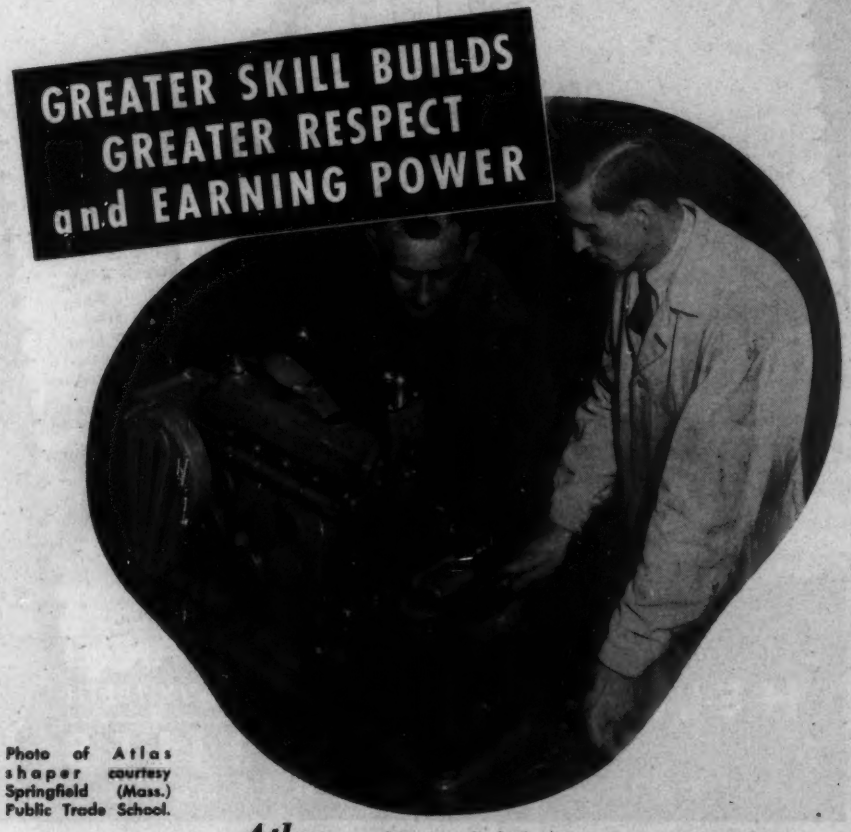

Photo of Atlas shaper courtesy Springfield (Mass.) Public Trade School.

Atlas machine tools help you give your students a better start in industrial life. They enable you to provide a well-rounded practical course at low cost. And low equipment cost means you can have enough tools in your shop to concentrate on the practical operating skill demanded by modern industry. As skill increases, your course earns greater respect from local industry and your students' earning ability increases.

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Uncle Sam is Calling Schools, Coast to Coast, to Participate in the Big G.I. PROGRAM

Every community in every state has an important part to play in putting America's fighting men back in gainful occupations.

All schools are expected to take a leading part in this vast peacetime training program.

Uncle Sam knows these schools must have the right machinery, equipment, and supplies to do their job well. And he wants them to have such things NOW.

As America's headquarters for School Training Supplies we are rendering such service to schools in all parts of America. To insure early delivery and avoid unnecessary disappointment, refer to your latest B-G Catalog now and send in your order for *all* your needs at one time.

Buy War Bonds

BRODHEAD-GARRETT CO.

"Supplying Defense Training Needs to Schools in All 48 States"

CLEVELAND, OHIO

(Continued from page 28A)

pharmacist must be able to check improperly prepared prescriptions for errors, etc.

4. Inform the public what the profession of pharmacy is doing to enforce drug laws and what is being done to check improper distribution of drugs, summarizing actual investigation procedures.

5. Inform the public of the few times when pharmacists' licenses are revoked, pointing them out as examples of how the profession is on its guard to protect the public and how rarely such instances occur.

6. Inform the public fully of details of every court case in which the State Board testifies in the best interests of public health.

7. Inform all Legislators, Governors, State Nursing Councils, State and Federal Food and Drug Administrations, and Narcotic Bureaus of every action the profession takes to protect the public welfare.

♦ Ten basic objectives and twelve specific courses for general education for members of the armed forces are contained in a report which a committee of the American Council on Education has recently completed at the request of the United States Armed Forces Institute. The suggested instructional materials, planned primarily for the period following the end of hostilities, are already being prepared by the Institute for use in correspondence study and group instruction.

The report published for civilian use by the Council as "A Design for General Education" was prepared by a committee under the chairmanship of Dean T. R. McConnell of the University of Minnesota. The courses have been developed for men and women at the upper senior high school or junior college level. However, the Committee points out that persons who have served in the armed forces will possess a more mature point of view than the usual high school or junior college student, and the courses have, therefore, been prepared for adults.

"A Design for General Education for the Armed Forces" is No. 18, Series I, of the American Council on Education Studies. It is paper bound and sells for $1.25. Orders should be sent to the American Council on Education, 744 Jackson Place, Washington 6, D. C.

♦ Women with experience in radio repairing are needed to serve in the SPARS, according to Ens. Marjorie Laehr, Coast Guard recruiting officer at Milwaukee, Wis.

Approximately 70 SPARS will be assigned to Coast Guard radio repair shops for training as soon as women with radio repair experience can be enlisted or located within the service.

The first group of the U. S. Coast Guard Women's Reserve unit have already been assigned to radio repair shops in several naval districts where they devote four hours each day to classwork and four hours to working with radio technicians. This expedites their training period, and simultaneously gives the repair shops an opportunity to utilize SPARS immediately for such duties as they are capable of performing during their training.

Women between 20 and 36 interested in qualifying for enlistment in the SPARS may write to or call at the Coast Guard recruiting office, 110 E. Wisconsin Ave., Milwaukee, Wis.

♦ "Education for New Tasks" is the theme for the twenty-fourth annual observance of American Education Week, November 5–11, 1944. This theme will be highly appropriate at a time when the end of the war in Europe is imminent if it has not already come.

We spare no expense to get people ready to win the war, because we know that only a trained people can win. Public sentiment would not tolerate for a moment a proposal to send any American boy into battle without the best of training under the best instructors and with the best equipment that money can buy.

But we should do no less to prepare our young people to win the battles of the peace. There are, to be sure, immediate and pressing issues with reference to partial reconversion of industry, to the relaxation of government controls, to evidences of intolerance, and many others.

But ultimately we shall succeed in dealing with the peacetime problems ahead in direct proportion to the manner in which our human resources are prepared to deal with them. Now is the time when we must plan an educational program which will help the youth of today to win the peace.

American Education Week comes at an opportune time to stress the crucial role the schools can play in the nation's future. Plan now for an effective observance. Write the National Education Association, 1201 Sixteenth Street, N.W., Washington 6, D. C., for a list of helpful materials such as poster, manual, leaflets, sticker, plays, radio scripts, and other materials.

♦ The Milwaukee recruiting office has announced that The United States Coast Guard has been authorized to enlist a limited number of 17-year-old boys in the rating of Apprentice Seamen during the month of October, 1944.

Those accepted for enlistment as apprentice seamen in the Coast Guard Reserve are transferred immediately to Manhattan Beach Training Station, Brooklyn, N. Y., for 8 weeks' boot training, after which they will be assigned to general duty either at sea aboard swift Coast Guard Combat Cutters, LST's assault transports, or attached to shore stations which guard America's vital coast line and waterways.

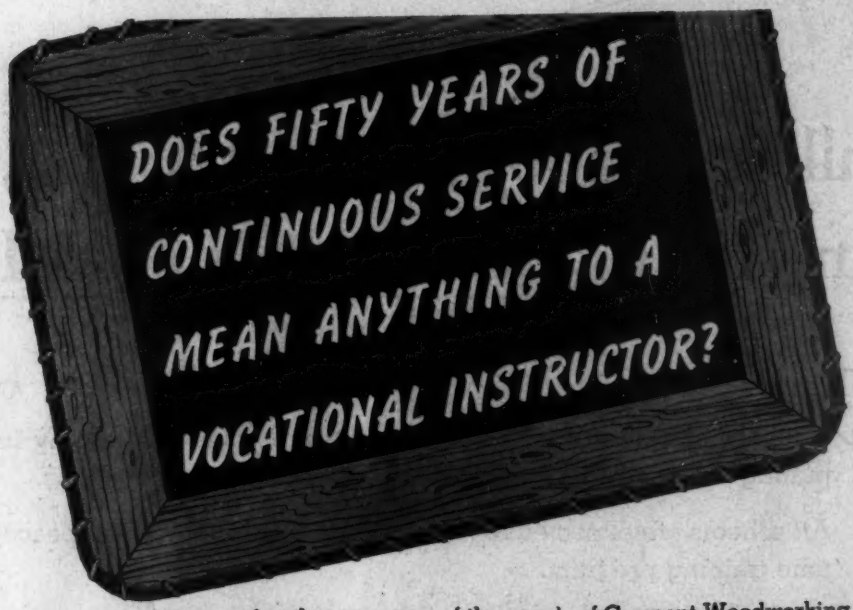
Men applying for enlistment are generally enlisted and transferred within 10 days after making application if they pass the required physical examination and their investigation reports are all favorable, which include consent of parents, school reports, police reports, and work reports. No physical waivers will be granted.

The address of the Wisconsin recruiting office is 110 E. Wisconsin Avenue, Milwaukee 2, Wis. Young men reporting to the office in person to make application should bring with them their birth certificate.

GEON RESINS

The Chemical Division of The B. F. Goodrich Co., Akron, Ohio, has developed a group of

(Continued on next page)



It means, in this case, that there are tens of thousands of Crescent Woodworking Machines in daily operation all over the country in every type of industry It is significant because your students are very likely to be called upon to operate a Crescent Woodworking Machine after you have trained them. Significant, also, is the fact that the highest type of production standards have always been rigidly observed enabling Crescent Woodworking Machines to enjoy the continued confidence of both the woodworking industry and vocational instructors. Still another point is the low maintenance cost of Crescent equipment. (The all-time average replacement cost is less than 5 cents per month, per machine!) In addition the product of a fifty year concern has the advantage of highly developed engineering knowledge from which stems greater accuracy, advanced safety devices, and many other desirable features. You can always choose Crescent equipment with the utmost confidence in their quality, safety and their ability to help you provide a more thorough training program.

If your plans call for a single machine or a complete shop installation Crescent will be glad to assist you in recommending the proper equipment. Of course, you won't be obligated. Write today for Crescent's catalog and literature.

Crescent MACHINE COMPANY LEETONIA OHIO

(Continued from previous page)

unique polyvinyl resins which they have named Geon Resins. These resins are thermoplastic in nature and are of two chemical types. Four specific resins are now available to industrial users subject to allocation under General Preference Order M-10.

Geon 100 series resins are special polymers of vinyl chloride characterized by their thermal and light stability, toughness, and chemical inertness. Geon 101 is especially designed for electrical applications. Geon 102 is adaptable to general services. Geon 203 has still greater solubility and thermoplasticity.

Compounded, Geon resins lend themselves to processing in many ways; including injection and compression molding, extruding, calendering, solution coating, impregnating, and film casting.

In comparison with other vinyl thermoplastics, compositions embracing the 100 Series Geons are characterized by their resistance to deformation at elevated temperatures.

Standard compounds are available for many uses, such as fabric and paper coating, electrical insulation, automotive and aircraft tubing, and others. In addition to the standard compounds, special formulations can be supplied for special purposes.

NEW PORTABLE TENSILE AND GUIDED BEND WELD TESTING MACHINE

A new portable weld testing machine has just been introduced by the Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y. This machine can be used to make (1) reduced section transverse tension tests; (2) guided bend tests (complete 180-deg. face or root bend); and (3) longitudinal all-weld metal tension test (0.505 in.).

It provides accurate data on tensile strength and ductility of weld specimens, and at the same time it is light enough so that it may be used right on the job. This latter feature makes the machine particularly useful where extensive field work is done.

The machine operates on the principle of the hydraulic jack. It can apply a maximum direct load of 40,000 pounds, but by using reduced section specimens, the tensile strength metals may be tested up to 150,000 pounds per square inch.

Jaws for making the transverse tension test, and plunger and die for the guided bend test are supplied with the machine. Jaws for the longitudinal all-weld-metal tension (0.505 in.) test are furnished on special order.

An illustrated booklet (ADI–889) describing construction and operation of this new Airco machine may be obtained upon request.

NEW WILSON COATED ALUMINUM-BRONZE ELECTRODE NO. 200

The Wilson Welder and Metals Co. announces a new Coated Aluminum-Bronze Electrode — Wilson No. 200. This new, coated high tensile bronze electrode is a shielded arc electrode, and can also be used as a filler rod in carbon arc welding. It will produce welding deposits of great strength and hot ductility, combined with desirable resistance to corrosion.

It may be used in the welding of most bronzes, malleable and cast iron or steel. It has other specific applications for which it is especially suited, and can also be used for welding dissimilar metals, such as cast iron to brass, steel to malleable iron, or the joining of any two metals which are weldable with aluminum bronze.

Sizes from ⅛ in. to 3/16 in. in 14-in. and 18-in. lengths are standard stock items. Sizes from 5/16 in. to ¼ in. in 18-in. lengths may be procured on special order.

The new Wilson No. 200 Coated Aluminum-Bronze Electrode is available through offices of the Wilson Welder and Metals Co., and their authorized distributors.

New Publications

Practical Occupational Therapy for the Mentally and Nervously Ill

By Louis J. Haas. Cloth, 432 pages, 6¼ by 9⅜ in., illustrated. Price, $6. The Bruce Publishing Co., 540 North Milwaukee St., Milwaukee 1, Wis.

A book by a man who has had years of experience in applying the principles of occupational therapy.

The book is divided into three parts. In the first part there is a brief history of occupational therapy, a statement of its aims, and then a careful coaching for those who have to adminis-

(Continued on page 36A)

Sheldon
PLANNING ASSISTANCE
. . . can help you

School architects, administrators and teachers, aware of postwar educational imperatives, are basing school building designs on tomorrow's needs. In planning special rooms and selecting vocational and laboratory equipment Sheldon can be of unusual assistance. Sheldon will also assist you in compiling budget estimates and writing specifications. Write today — request Sheldon Planning Assistance. Without obligating you in any way Sheldon Engineers will call and discuss your problems, ideas and plans.

LABORATORY VOCATIONAL Furniture

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Shop Equipment News

New Products — Publications

SAW LUBRICATOR

The DoAll Drip Applicator for cut-off machines is designed to apply cutting oil directly to the gullets of the saw. This results in longer saw life and permits the speed of metal cutting to be increased.

Saw Lubricator

A test showed that in a cutting job on solid 6320 steel forgings (Brinell 285) it took four minutes to complete one cut when the steel was dry. During this test the saw blade lasted for only 16 cuts. Cutting oil was then applied through the DoAll Drip Applicator with the result that a cut was completed in one minute and ten seconds and the life of the saw increased to 144 cuts.

The DoAll Drip Applicator unit consists of an 18-oz. sight feed, drip-type oiler, a bracket, wing nut, tubular pipe and fittings. Further information can be obtained from the DoAll Company, Des Plaines, Ill.

For brief reference use IAVE—910.

FRANKLIN LIQUID HIDE GLUE

With the ever increasing demand for the conservation of material, especially wood, more emphasis than ever before is being placed on the utilization of glued-up material that would be discarded ordinarily as scrap.

This is especially true in the public school system where instructors are doing a commendable job in the continued wartime school operations.

A fine example of wood conservation and utilization as practiced at the Boys' Trade School in Columbus, Ohio, is shown in the accompanying photograph.

Gluing up scrap pieces

Using Franklin liquid hide glue, students are conserving wood of every possible type from packing boxes to old flooring.

Ralph C. Wood, instructor of general woodworking at the Boys' Trade School, uses Franklin glue exclusively in his classes wherever hide glue is required, and reports that his students turn out a neater and better finished job with this product.

Franklin glue will not harm tools, stain wood, and needs no heating or mixing. Instructors in woodworking, carpentry, and cabinetmaking find it ideal for use in the school workshop. It is manufactured by the Franklin Glue Co., Columbus, Ohio.

For brief reference use IAVE—911.

TESTIMONIAL DINNER FOR ED CHERRY

Ed Cherry, known as the Dean of Commercial Travelers in the school shop field, was honored recently at a testimonal dinner by executives of The Stanley Works and his older Stanley Tools associates and friends. The occasion signified Mr. Cherry's 55 years of service with the Stanley organization and followed closely after his seventieth birthday.

Mr. Ed. Cherry

When first employed by Stanley, Ed Cherry worked in the New York sales office and after a few years became one of the two salesmen employed by the Stanley Rule and Level Company. His territory covered everything east of the Mississippi River.

During the Spanish American War, Mr. Cherry served with the U. S. Navy and during World War I he was in Washington as a representative of the company.

Throughout his selling career, Ed Cherry did all he could to popularize the use of good tools in the school shop by displaying tools at teachers' colleges and school conventions. His activity in establishing contacts with schools was largely responsible for the establishment of the Educational Department of Stanley Tools in 1923. Since 1932 Mr. Cherry has been devoting all of his time to the school field.

An interesting sidelight on Mr. Cherry's traveling record is that it was not until 1932, when he was 58 years old, that he learned to drive a car and started traveling by automobile. Since then, previous to the war, he has covered approximately 20,000 miles a year.

PHOTOCOPIES EASILY MADE

A simple, inexpensive, photocopying machine, which occupies a space approximately 12 by 12 by 24 in., and which requires no camera, no darkroom, and no skilled operator, has just been perfected.

It will make photographically correct copies directly from blueprints, drawings, tracings, typed, or printed materials.

Photocopying Machine

Copies up to 18 by 22 in. can be made at the rate of 120 copies per hour, although the first copy will require approximately 3 minutes.

For further information write to American Photocopy Equipment Co., 2849 North Clark St., Chicago, Ill.

For brief reference use IAVE—912.

GRAPHITE STICK-FORM COMPOUND

This new medium-soft waxlike graphite lubricant in handy solid form, known as Dixon's Graphite Slipstick, has just been introduced by Joseph Dixon Crucible Co., Jersey City 3, N. J.

The graphite lubricating stick is enclosed in a cylinder 3 inches long by 7/8 of an inch in diameter. Each end of the cylinder is provided with a disk. By pressing one disk inward, the stick is ejected to the required length for application.

Graphite compound

After using, the other disk is placed on top of the exposed stick and the lubricant can be pushed back into the cylinder again.

For quick, lasting rub-on lubrication of sticking doors, bicycle and other chains, auto-door striking plates, window and drawer slides, firearm actions, typesetting machine parts, coin-operated machines, automobiles, airplanes, watercraft, and almost endless other maintenance and servicing uses on equipment in schools, homes, factories, offices, stores, farms, railroads, bus, and steamship lines.

Adheres to metal, wood, fiber, leather, and all hard and soft materials.

For brief reference use IAVE—913.

EDUCATOR'S GUIDE TO FREE FILMS

The Fourth Annual Edition of Educator's Guide to Free Films may now be had. Over one hundred thousand users are using this guide. The edition lists 2165 films of which 444 are silent 16mm., 1185 are 16mm. sound, 206 are 35mm. silent, and 330 are 35mm. sound. In all, 3598 reels, and in addition 203 slide films provide rich supplementary materials at a minimum cost. The Guide is of use to rural schools, city and county systems, colleges and universities, libraries, and all educational institutions.

Address Educator's Progress Service, Randolph, Wis.

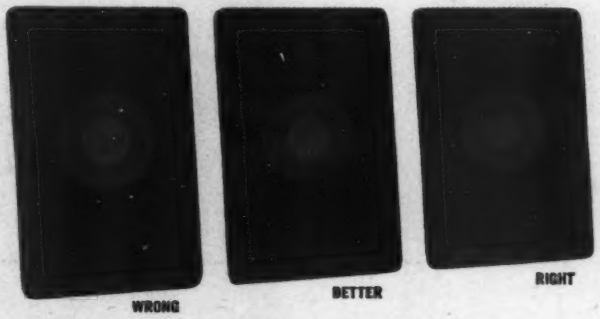
(Continued on page 34A)

Right: Much of our wild life is beautifully camouflaged by Nature. The right protective coloring helps small birds and animals survive—makes it easier for them to hide from their enemies.

Wrong: Camouflage is all right in nature—all wrong in industry. Monotone-colored machines cause eye fatigue—millions of man-hours lost.

Color Dynamics

A new system of using color to minimize workers' eye fatigue which will interest all teachers in trade or industrial schools.



• Any Pittsburgh representative can help you apply Color Dynamics with the aid of a Pittsburgh Color Selector. Selection of correct focal colors is made by placing different color panels behind a Vista Green panel (the color generally recommended for non-critical parts) so color can be observed through a round opening. The test is completed by placing a piece of material being processed, across the opening. The focal color which contrasts best with machine and material—is the correct color to use. The above illustrations show Color Dynamics at work. The last panel illustrates how the use of correct focal color provides proper contrast between material and machine—emphasizing critical parts while Vista Green makes non-critical parts recede.

PERHAPS the simplest way to arrive at an understanding of the Pittsburgh system of Color Dynamics is to think of it as *exactly the opposite of camouflage.* Instead of obscuring and hiding, color becomes an agent charged with the duty of making it easier for workers to see their work.

On machines, color is used to highlight the operating parts so that they stand out—to give a clear contrast between the machine itself and the material being fabricated—to focus the worker's attention on his job. By this means, eye wandering and nervous tension are minimized.

For motorized trucks, cranes and overhead conveyors (which are responsible for many industrial accidents) colors of high visibility are employed. These act as danger signals and are recognized as an important safety factor.

• A free copy of the new book "Color Dynamics" will be mailed to any teacher who sees an opportunity of fitting this system into his courses. You will find this study of the utilization of color energy both stimulating and practical. For your copy write Pittsburgh Plate Glass Co., Paint Div., Dept. IV-11, Pittsburgh 22, Pa.

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PITTSBURGH PLATE GLASS COMPANY

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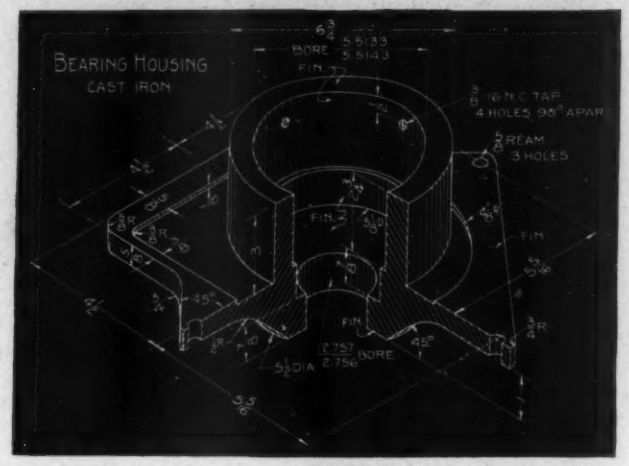
PITTSBURGH STANDS FOR QUALITY PAINT AND GLASS

A PROBLEM FOR YOUR "P. I. T.s" WITH DIRECT BEARING ON THE FUTURE!

When your Pre-Induction Trainees enter the Service, they'll be called upon to read blueprints. Drawing the correct orthographic views of this Bearing Housing will help them to learn blueprint-reading.

Before you get them to work on this down-to-earth problem—equip them with Typhonite Eldorado Pencils. They'll enjoy using the drawing tool of professionals — and you'll enjoy the results! Eldorado produces clean lines of remarkable uniformity and clarity. Blueprints made from such drawings are a credit to the student and a pleasure to the teacher. Satisfaction all around!



SOLUTION: We will send you a free blueprint showing the solution of this problem. Write to the address below within thirty days. Specify Blueprint No. 138-J11.

TYPHONITE

ELDORADO

SCHOOL BUREAU, PENCIL SALES DEPT., JOSEPH DIXON CRUCIBLE COMPANY, JERSEY CITY 3, N. J.

(Continued from page 32A)

DELTA MANUFACTURING CO. WINS FIRST PLACE

The Delta Manufacturing Co., of Milwaukee 1, Wis., has recently been awarded first place for its advertising in the annual competition sponsored by the National Advertising Agency Network.

The Delta campaign consisted of large advertisements in full color which appeared in *Parade* and *This Week* magazine, and was directed to the present and potential home craftsman.

The Delta advertising campaign was entered in the National Advertising Agency Network competition by Delta's advertising agency, Hoffman & York, Milwaukee.

APPOINTED LITTELFUSE DISTRIBUTOR

Allied Radio Corp., Chicago, distributors of radio and electronic equipment, have been appointed a major authorized distributor for Littelfuse, Inc., manufacturers of fuses, neon indicators, fuse clips, mountings and accessories, the new "Signalette" panel-type signal indicator, and other circuit protection products.

Complete Littelfuse literature will be sent on request to Allied Radio Corp., 833 W. Jackson Blvd., Chicago 7, Ill.

Allied Radio Corp., also has released for free distribution a booklet containing a wide selection of publications on radio, electronics, and related subjects. Listings cover simplest fundamentals to advanced practices for beginner, student, radio amateur, instructor, technician, service and maintenance man, and engineer.

To obtain this booklet without charge, write to Allied Radio Corp., 833 West Jackson Blvd., Chicago 7, Ill.

NEW POST CALENDAR

The Frederick Post Company announces their new, 15¾ by 24½ in., 1945 calendar which features a 56-page weekly pad, with giant weekly dates all on one line, and large previous and following months on each page. The calendar is printed in six colors. It also includes a section of technical data for the engineer and draftsman containing charts on wire and sheet-metal gauges, screw threads, etc.

Post Calendar

The price of the calendar is one dollar. When ordering other Post merchandise the calendar is furnished free. The Frederick Post Co., Box 803, Chicago 90, Ill.

For brief reference use IAVE—914.

NEW LINCOLN CALCULATOR

A new Lincoln calculator, designed to determine the welding and preheating and interpass temperatures of steels, where experience indicates the need for preheating, has been announced by the Lincoln Electric Co., Cleveland, Ohio.

This calculator which is 6¼ in. in diameter, consists of four movable sections of heavy cardboard stock. It is intended to serve as a guide in instances where steels have a higher content of carbon and other alloys and require preheating to minimize the tendency toward excessive hardening and possible cracking of the base metal adjacent to the weld.

Calculator for welders

Complete instructions in the form of six simple steps are printed on the outside sections of the calculator.

For brief reference use IAVE—915.

MILWAUKEE MILLING MACHINES

The Kearney & Trecker Corporation, Milwaukee, Wis., have issued a ring cover containing folders on milling machines of the following models: H, K, and simplex and duplex bed type. Dividing heads, attachments, and accessories also are illustrated and described.

This firm has also issued a number of pamphlets on special tools and appliances for doing difficult jobs with accuracy. These pamphlets come under the headings of center scope; slotting attachments; could you bore this job in a single setup?; ever try and get an angle on a bore like this?; and similar problems that arise in machine shops and toolrooms.

5400 HOURS OF CREATIVE ENTERTAINMENT

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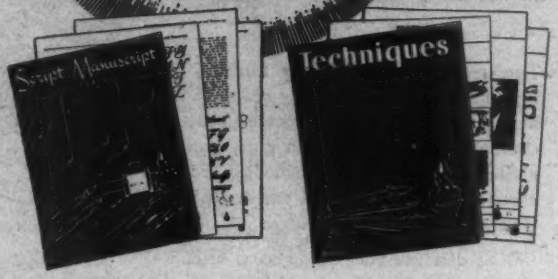
Here's a library of 4 Higgins Art Books guaranteed to give hours of creative entertainment to professionals and students alike. Drop in and thumb through these valuable books at your nearest Higgins Ink dealer...and see for yourself what a buy they are!

Display cabinet free with assortment of 4 titles.

SINCE 1880



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Giachino and Feirer

Planned and organized throughout as a complete, prevocational course in beginning metalwork, high-school level. Without equal in coverage of tools, equipment details, and procedures. Special attention to measuring and layout, abrasives, other often-neglected factors. Very attractive to boys. More than 170 photographs; 133 drawings. In two bindings: Paper $1.84. Cloth, $2.75.

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The book that started Ralph Williams on the way to becoming one of the sharpest writers on elementary electricity and radio now appearing in print. See his latest magazine articles, and examine his book—one of the most up-to-date and best illustrated works on fundamentals of electricity now offered. Only modern devices, only the best methods, proved in a well-organized shop, are represented. Nearly 400 illustrations, the best in any book of its kind. Each unit complete with special problems and activities following the discussion. Bound to arouse enthusiasm and really teach the subject. For grades 10 to 12. Cloth, $1.92.

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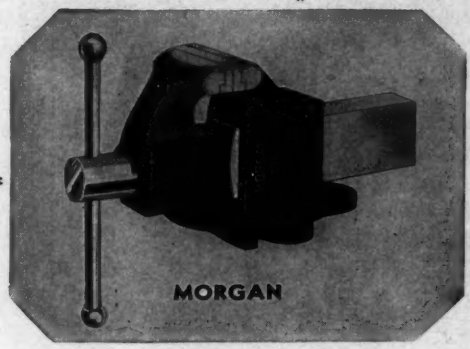

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The new 1944 Gluing Guide, just printed, is a better teaching aid than ever before. It includes new chapters on the mechanics of resin and casein glue, common gluing faults and their remedies, how to choose between resin and casein glue, etc. Twenty-four pages illustrated.

You can use the Guide as a brief but thorough textbook on wood gluing with modern, improved resin and casein glues.

Send for your free copy now. (Use a school letterhead, please.) Address: CASEIN COMPANY OF AMERICA, Dept. 11, 350 Madison Avenue, New York 17, N. Y. (Division of The Borden Company)

(Continued from page 31A)

ter this type of treatment to the patient. The various crafts adapted to the needs of the different kinds of patients who are mentally ill also are discussed.

Part II describes the organization of an occupational therapy department, the records that must be kept, financing that must be done, and the duties of those who direct this work.

There is also a thorough discussion of the equipment, supplies, and materials that will be needed, and layouts of the various shops in which the work is to be done are presented.

Part III lists, describes, and shows projects for bedside and other therapeutic work that may be offered. This book is of especial importance when one considers the thousands of soldiers who will return from the European and Pacific war theaters in dire need of a readjustment of their mental faculties.

Appraising Guidance in Secondary Schools

By Grayson N. Kefauver and Harold C. Hand. Cloth, 260 pages, 5⅞ by 8⅝ in. Price, $3.50. The Macmillan Co., New York, N. Y.

A comprehensive study of existing guidance services in order that proper evaluation, techniques, and criteria may be set up for further study.

The book contains reports on two studies, the first covering 19 schools in 12 cities, and the other a study which extended over a three-year period.

Woodworking for Everybody

By John G. Shea and Paul N. Wenger. Cloth, 187 pages, 8½ by 11 in., illustrated. Price, $2. International Textbook Co., Scranton, Pa.

A book for the student in the junior and senior high school woodworking shops, as well as for the hobbyist, modelmaker, and home craftsman who delights in making well-designed objects of wood.

The book is well illustrated, and tells an interesting story about wood and its many uses, explains what hand tools and equipment are needed by the shopworker, gives detailed instruction about the various processes which the woodworker must know, describes how to use the woodworking machinery commonly met with, gives some excellent safety first hints, and offers a number of very fine projects.

Radio Servicing Course Book

Paper, 224 pages, 8¼ by 10¾ in., illustrated. Price, $2.50. Supreme Publications, Chicago, Ill.

A book prepared by the staff of consulting engineers and instructors of the Radio Technical Institute. It contains 22 lessons on radio servicing for the beginner who wants to enter this field, or for the experienced serviceman who wishes to keep abreast of new service methods.

The book contains numerous illustrations, tables, and graphs. It is designed for home-study use.

Form and Standards for Thesis Writing

By N. William Newsom and George E. Walk. Paper, 103 pages, 8⅜ by 11 in. Price, $2.50. International Textbook Co., Scranton, Pa.

A manual giving explicit information on how the content of a thesis is to be arranged and organized.

Institutional policies; format; language practices; construction of tables, graphs, and figures; form and placement of citations, footnotes, and references; and the like are all called to the attention of the candidate who is writing the thesis, and samples are given in practically all instances.

How to Operate a Lathe

By John T. Shuman and Lewis H. Bardo. Cloth, 161 pages, 5¼ by 8 in., illustrated. Price, $1.75. John Wiley & Sons, New York, N. Y.

A text containing the fundamentals on lathe operation in question and answer form.

The book with its numerous illustrations divides the subject matter into a discussion of the lathe parts, how to prepare the work, how to hold and drive the work, what tools to use, what speed and feed to employ, why cutting fluids are used, the various types of work that can be performed on the lathe, and how to cut threads.

Channeling Research into Education

By John E. Ivey, Jr. Paper, 191 pages, 6 by 9 in. American Council on Education Studies, Washington, D. C.

A group study of the resources and problems of the South and how these may be embodied in educational materials that may be used in the fields of natural, physical, and social sciences for school and college use.

An Outline of the Home Furnishing Periods

By H. P. Osborne. Cloth, 168 pages, 7 by 9¾ in., illustrated. Price, $3. Outline Publishing Co., 1628 American Ave., Long Beach, Calif.

This is the third edition of a very helpful reference book on period furniture. The information, though brief, is quite comprehensive. The book contains a considerable number of pictures illustrative of the various styles.

Fifty Things to Make for the Home

By Julian Starr, Jr. Cloth, 207 pages, 6¼ by 9¼ in., illustrated. Price, $2. McGraw-Hill Book Co., New York City.

A book for the home crafter containing descriptions and plans for many interesting and useful things for the home, the home grounds and the playroom.

Simplified Industrial Mathematics

By John H. Wolfe, William F. Mueller, and Seibert D. Mullikin. Cloth, 281 pages, 5 by 8 in., illustrated. Price, $2. Published by McGraw-Hill Book Co., New York, N. Y.

Written for those engaged in industrial work which requires a knowledge of how to apply mathematics, the book covers a thorough review of the arithmetical operations encountered with fractions and decimals, and then takes up formulas, geometry, and trigonometry.

There also are chapters on screw threads and gearing. A 4-place table of the natural trigonometric functions has been made part of the book.

The Textile Arts

By William H. Johnson and Louis V. Newkirk. Paper, 144 pages, 8¼ by 11 in., illustrated. Price, $1.20. The Macmillan Co., New York, N. Y.

An excellent book of junior and senior high school shops. The material is simply presented and clearly illustrated.

The book discusses the subject under the fol-

(Continued on page 41A)

TEXTS OF MERIT

GENERAL SHOP WOODWORKING

By Fryklund & LaBerge

Ideally suited to school shop needs for beginning courses. Particularly adaptable for text use in general shop classes. Covers basic fundamentals of hand woodworking. 80 cents

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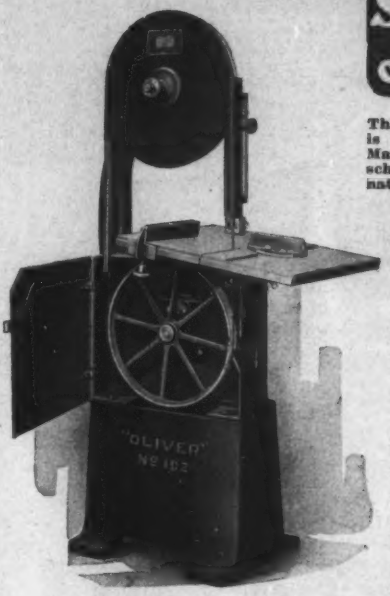

This machine, the No. 192 is ideal for school shop use. Many have been installed in school shops throughout the nation.

It will saw wood, hard rubber, paper, compositions, fibres, sprues of many soft metals, and with proper equipment it is especially effective in sawing sheet steel.

Rips to 11" wide. Cross-cuts and miters up to 8". Table tilts 45 degrees to the right. Motor is mounted on the arbor. It's a quality machine throughout.

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GRAND RAPIDS, MICHIGAN

NO MORE CHILLED JOINTS

FRANKLIN Liquid Hide GLUE

NO WORRY ABOUT WASTE.
NO MIXING OR HEATING.
Always Uniform
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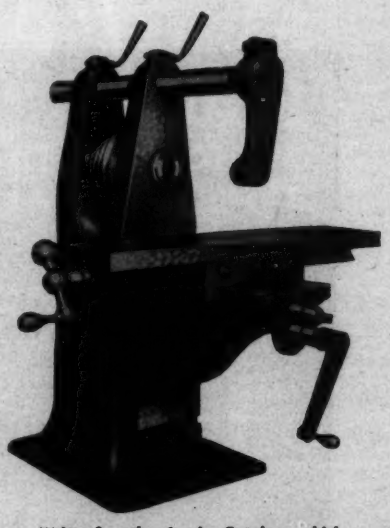

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The unusually low cost of Lewis metal and wood working tools—Shapers, Mills, Band Saws, Jointers and many others—enable them to fit in with all shop programs. They are furnished as plain foundry or semi-finished castings, with all necessary materials and detailed construction blueprints . . . and can be completed with ordinary shop facilities.

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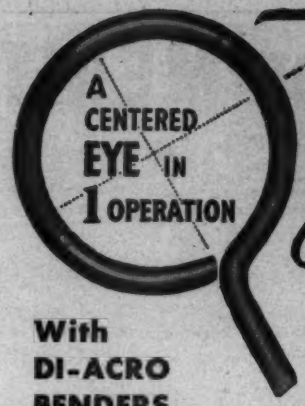

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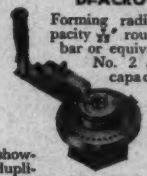
DI-ACRO Bender No. 1
Forming radius 2" approx Capacity 3/8" round cold rolled steel bar or equivalent. Also Benders No. 2 and 3 with larger capacities



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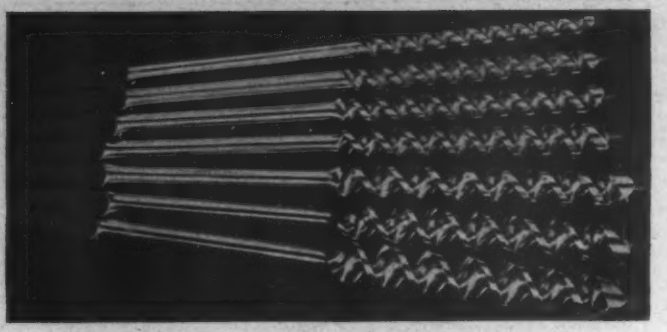

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STAR AUTOMATIC TACKERS

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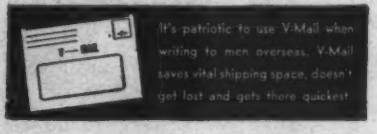
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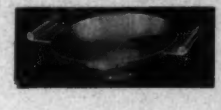

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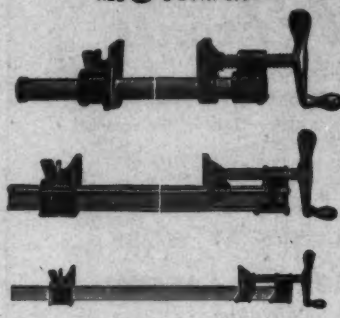

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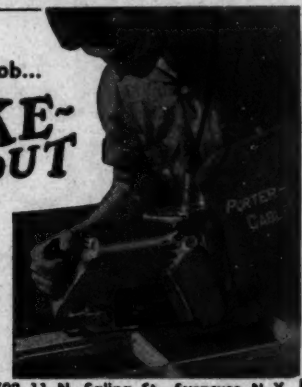

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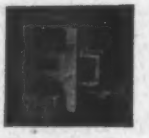

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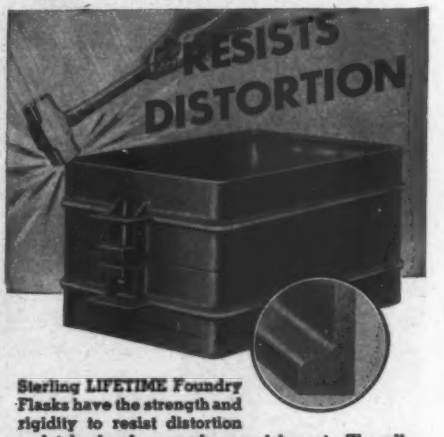

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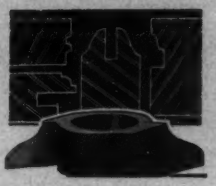

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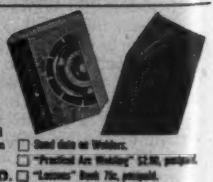

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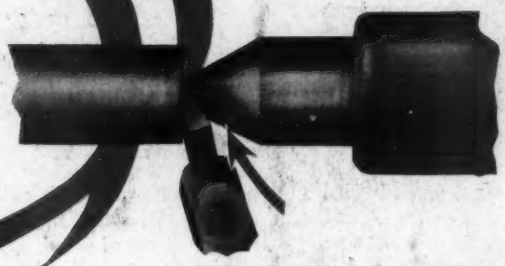
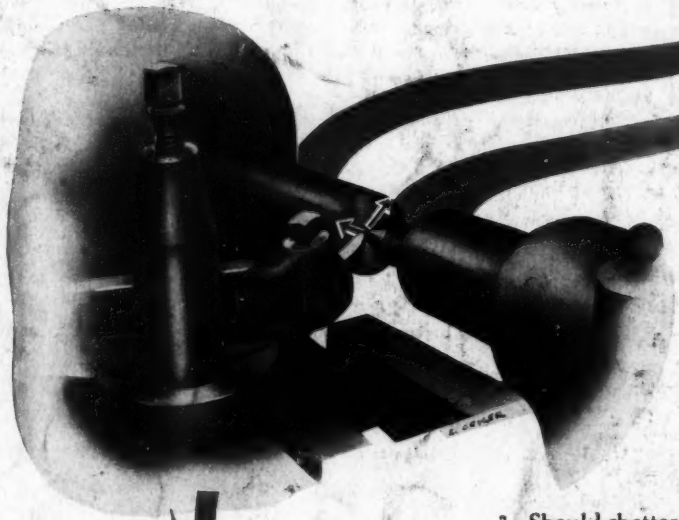


1. You'll save lots of time and effort if you'll keep handy an extra tailstock center that has been grooved or flat ground on the taper. This makes special tools unnecessary because it leaves room for a standard shape tool between work and center. Caution: Be sure flat surface is less than half way through point or it will act as a reamer.



2. For the finishing skim cut, *work from the inside out.* In other words, you start with tool point at the center hole and cut toward outside diameter of the piece with tool edge at slight angle with end of work.

3. Should chatter marks appear on the work, it is because work is running too fast, feed is too great, or angle of tool is too slight. All of these are easily corrected.

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